

# **Chinese ‘Sea-Turtles’ and Importing a Culture of Innovation: Trends in Chinese Human Capital Migration in the 21<sup>st</sup> century**



**By Hannah Sieber**

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**Advisor: Tim Lenoir, Kimberly Jenkins University Professor**

## Contents

Illustrations .....	3
<i>“If you think in terms of a year, plant a seed; if in terms of ten years, plant trees; if in terms of 100 years, teach the people” - Confucius 551-479BC. ....</i>	<i>7</i>
<b>Preface.....</b>	<b>8</b>
<b>Introduction.....</b>	<b>11</b>
<b>Chapter One: Historical Legacies and Innovative Tendencies.....</b>	<b>20</b>
<i>Entering a Global Environment .....</i>	<i>23</i>
<b>Solving the Innovation Gap: The Promise of Human Capital .....</b>	<b>27</b>
<i>The Rise of Returnees.....</i>	<i>27</i>
<i>Government Policies towards Returnees.....</i>	<i>31</i>
<i>Who Were China’s First Returnees? .....</i>	<i>35</i>
<b>Appendix to Chapter One .....</b>	<b>37</b>
<b>Chapter Two: From Imitation to Indigenous Innovation .....</b>	<b>42</b>
<b>An Academic Perspective on Innovation.....</b>	<b>42</b>
<i>Critical Areas of Consensus in Innovation Scholarship.....</i>	<i>44</i>
<b>Creating a Knowledge-Based Economy: China’s 2006 Innovation Policy .....</b>	<b>45</b>
<i>From Global Factory Innovation to Self-Made Innovation? .....</i>	<i>46</i>
<i>Global Reactions to China’s MLP.....</i>	<i>49</i>
<b>Innovation in the Chinese Market Place .....</b>	<b>53</b>
<i>Incentives: The Birth of Special Economic Zones .....</i>	<i>55</i>
<i>Institutions in Modern China.....</i>	<i>58</i>
<i>Financing a New Venture .....</i>	<i>60</i>
<i>The Urban Environment.....</i>	<i>63</i>
<i>Outputs: Patents and Papers.....</i>	<i>63</i>
<i>Research .....</i>	<i>72</i>
<b>Lesson from Foreign Owned Invention and Homegrown Research.....</b>	<b>78</b>
<b>Appendix to Chapter Two.....</b>	<b>81</b>
<b>Chapter Three: Changing Trends in Human Capital: the New ‘Returnee’ .....</b>	<b>83</b>
<b>The Role of Human Capital in Innovation .....</b>	<b>83</b>
<b>Overseas Chinese &amp; Non-Returnees .....</b>	<b>85</b>
<i>Profile of the Modern Returnee .....</i>	<i>85</i>
<i>American Policies Towards Chinese Immigration.....</i>	<i>87</i>
<i>The Rising Middle Class: A New Economic Phenomenon in China.....</i>	<i>93</i>
<i>The Lonely Returnee.....</i>	<i>102</i>
<b>The Repatriation Decision: Opinions from Raleigh-Durham .....</b>	<b>104</b>
<b>Supplanting the Brain Drain: China’s Brain Circulation .....</b>	<b>109</b>
<i>The Returnee Entrepreneur.....</i>	<i>109</i>
<i>Case Study of Zhang Xin.....</i>	<i>112</i>
<b>Conclusion: The New Brain Drain: The Exodus of China’s Dreams .....</b>	<b>116</b>
<b>Reference List.....</b>	<b>122</b>

## Illustrations

### I. Figures

#### Chapter One

Figure 1.1: Returnees By Year.....	29
------------------------------------	----

#### Chapter Two

Figure 2. 1: Creativity to Economic Growth Flow Chart .....	54
Figure 2. 2: (Shanghai Pudong's) Zhangjiang (High-Tech Park) Entrepreneurship Source.....	58
Figure 2. 3: Total Patents Filed & Granted in China from 1997 - 2011, by Residents, Non-Residents, and Abroad .....	65
Figure 2. 4: Percentage of Patents Granted as Filed by Applicant Categories: Resident, Non-Resident, and Abroad.....	67
Figure 2. 5: Type of Patent Filed by Foreigners and Residents.....	69
Figure 2. 6: Patent Applications & Grants for Invention Patents at Total.....	70
Figure 2. 7: Educational Backgrounds of 2006 China Center for Economic Research.....	77

#### Chapter Three

Figure 3. 1: 2012 Top International Destinations for Undergraduate, Masters, and PhD Study..	86
Figure 3. 2: Chinese Students in the US as % of Total International Students in US .....	88
Figure 3. 3: Differences between different Immigration Documents .....	89
Figure 3. 4: Duke International Students from China by Year, by Program .....	92
Figure 3. 5: US Media Outlook on Overseas Chinese in US.....	97
Figure 3. 6: Greatest Influencing Factors in Choosing to Study Abroad.....	99
Figure 3. 7: Factors Influencing One's Decision to Study Abroad .....	106
Figure 3. 8: US 1-94 Visas from 2002-2016, by Region.....	114
Figure 3. 9: I-94 Visas Awarded in 2011 by Country and Region .....	114

### II. Tables

#### Chapter One

Table 1.1: Education Policies Towards Returnees from 1989-2011 .....	38
--	----

#### Chapter Two

Table 2. 1: Statistics on R&D of Hi-Tech Enterprises in Zhangjiang Park.....	57
Table 2. 2: Statistics on Foreign Investments for Zhangjiang Hi-Tech Park.....	62
Table 2. 3: Foreign Investment Granted to the Zhangjiang Hi-Tech Park in 2004 .....	62
Table 2. 4: Percentage of Patents Granted as Filed by Applicant Categories: Resident, Non-Resident, and Abroad.....	66
Table 2. 5: Patent Grants by Percentage .....	71
Table 2. 6: Publications by the Chinese Academy of Sciences from 1997-2009 .....	73
Table 2. 7: National Total of Publications in China from 1998-2009 .....	75
Table 2. 8: Key Policies in Science & Technology Administration and Innovation in China and the US since 1982 .....	81

#### Chapter Three

Table 3. 1: Overseas Degrees Authenticated by CSCSE, 1991-2005 .....	90
Table 3. 2: Chinese Student Enrollment at Duke University.....	91

Table 3. 3: Patterns of Interaction with China, by Overseas Mainland Academics in the US and Canada.....	93
Table 3. 4: Statistics on Students who Leave China, Come to the US, and Return to China, by Year, From 1995-2012.....	115

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*“If you think in terms of a year, plant a seed; if in terms of ten years, plant trees; if in terms of 100 years, teach the people” - Confucius 551-479BC.*

## Preface

*Beijing, 2009.* My first time in China marks many of my favorite memories: performing the morning warm-up routine, clad in my bright blue and red school uniform; trying to understand my art teacher's description of traditional Chinese knot-tying in order to decorate my host family's apartment for the Chinese new-year; leaving school each afternoon to sit on park benches in one of Beijing's famous parks, read an English book, and wait for Chinese students to approach me and ask to practice English. When I think back to my time in China I am filled with joy.

I first lived abroad in China when I was seventeen. I lived with a Chinese home-stay and attended a local Beijing school through an exchange program my high school offered. The program was designed to immerse students in Chinese culture, learn Chinese arts and history, and engage with the local community. My Chinese family, as I call them, consists of Grandpa, Grandma, Dad, Mom, and Victor, a 15 year-old boy who attended the same Beijing school as I. It took me over a month to realize the sacrifices the family made in order to host an American student. Despite belonging to Beijing's elite, the family still lived frugally and saved their money, a traditional value in Chinese culture. In order for me to have my own small room, I took Victor's room, while Victor slept with his Mom, and Victor's dad slept on the couch or on a small cot in the laundry room. Education and global exchange were of the utmost importance to this family, and they placed my learning and their son's academic commitments above all else. Victor's English was impeccable (far better than my Chinese at the time) and a reflection of the global influence and opportunities of his generation, as well as his sedulous work ethic and his parents' desire to raise a truly global citizen.



At the end of my stay in China I returned home to spend the summer with my family before I started college in the fall. That same fall, Victor completed the second half of the exchange program, spending a semester living with a local family in my hometown just outside of Boston. At the time, I didn't realize the full impression that living with my host family would make on me; back then I only recognized how incredibly unique it is to live abroad at such a young age.

Throughout college I studied Chinese, spent time with many foreign students, and developed lasting relationships with many Chinese language partners. I returned to China for a study abroad program my junior year at a university in Hangzhou, China, where I attended classes taught entirely in Chinese and lived with a Chinese roommate. During my semester there I visited Victor and his family in Beijing, marking our first time together for the better part of three years. Victor was now a senior and talking about his desire to travel and live abroad in America.

This year everything changed. Victor is now a freshman at Duke University studying Biology and English. His decision to study at Duke places him in a growing trend of Chinese students who venture overseas to complete a part of their education in the West.

My thesis is not directly about Victor, however his story has inspired this work in two different ways. First, I am writing this thesis as a culmination of my Duke studies. I must attribute many of my interests, passions, and love of global exchange to my host family from Beijing. They never stopped pushing me to speak Chinese at dinner, to try new foods, and to experience the local culture. Because of them I continue to travel the world and immerse myself in many cultures, always trying to fully understand the local culture. To them I am incredibly grateful.

More relevant to my thesis, however, is my curiosity, fascination, even amazement at students like Victor. Studying abroad is no simple feat. The life of Chinese students in the West prompts many questions: Which US values will likely have a lasting impact? When these students return to China what kind of relationship emerges between their Western learned philosophies and their traditional Chinese values? How will these students adapt to the new environment in China, in which society holds different expectations of them than of their local counterparts? My study is a critical analysis of the growing trend of Chinese students studying in the West, the increasing number of Chinese policies and incentives to attract these students back, and the role of high-tech innovation, creativity, research and development central to the trend.

## Introduction

Originally known as a country of innovative activities and radical inventions, China has earned a different reputation in the past few centuries. Although credited with the invention of paper, the compass, gunpowder, and printing, China has recently become synonymous with words such as “imitation”, “fake”, and “copyright infringement”. A 2008 *Economist* article about indigenous innovation in China reveals the global perception towards Chinese business: “Imitate or die: Invention is costly and frustrating work. India and China have better things to do.” A 2011 *Financial Times* article about creating business leaders in China repeats this perception with the title: “Rote learning is no answer to a search for heroes.” My favorite example of such thinking is an October article by the current affairs magazine, *Slate*, which argued, “The Chinese Steve Jobs is Probably a Pirate.” Such critiques are common in the popular Western press. They focus on the desire of many Chinese businesses to copy certain successes of the outside world. However is China only coping Western ideas? My thesis explores the different inventions and innovations happening in China and who is responsible for driving the growth.

Although Western critics believe that many of China’s inventions are copied or stolen, Chinese government officials argue that China is on a path towards innovation. China’s recent focus on innovation stems from its desire to be globally competitive. Global competitiveness requires global interaction and exchange. In China, this need for exchange is fueled by the short-term emigration of many of its scholars. In the past thirty years, Chinese has seen a significant rise in emigration. In 2012, 180 million students left the country (Ministry of Education), among which roughly 200,000 came to America (Open Doors). The emigration of Chinese scholars to the West is not a new trend. Most scholarship on Chinese education and Chinese emigration

points to a start date of 1979, when Deng Xiaoping, China's then Chairman, encouraged the Education Commission together with the Chinese Academy of Sciences (CAS) to send 3000 Chinese students abroad for five years each (Wang, H.; D. Zweig; et al., 2011: 217). The initiative was driven by the Chinese government's desire to remedy China's dearth of talented students in science and technology, a result of the drastic reforms implemented by Mao Zedong between 1966-1976 (discussed later). The government believed that letting people go abroad and learn in a foreign environment would enable China to reap the benefits of foreign scientific discoveries and innovations.

In the Chinese language these students are referred to as 海归, *haigui*, which literally translates to “sea” and “return”. *Haigui* has come to signify students who study at foreign universities and return to China with their new knowledge. But, the word *haigui* is also a homonym with the Chinese word *haigui*, meaning “sea-turtle,” a word pronounced exactly the same but written differently, 海龟。The phrase “sea-turtle” was a translation first used by Ren Hong, a Chinese citizen, who left Guangzhou on a tea freighter to study at Yale University (Wattanavitukul, 2002). For Ren Hong, “sea-turtles” grew up on Chinese shores, then crossed the sea to gain knowledge with which they would eventually return to China. Since its coinage almost three decades ago, “sea-turtle” has become an accepted and commonly used term by mainstream media and citizens to refer to students belonging to this growing phenomenon. Although the characteristics, native environments, and destinations of sea turtles have changed dramatically over the last thirty years,<sup>1</sup> the phenomenon continues to grow and is still central to providing new information and ideas to a country that throughout modern history has been a

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<sup>1</sup> The Chinese Economic Review cites that most sea turtles now hail from urban elite families,

predominantly closed society. The change in “sea-turtle” characteristics will have consequences I will explore in Chapter Three.

Although “sea-turtles” is the common phrase used in Chinese, to avoid confusion, most American literature refers to these same students as “Returnees”, a word that connotes the same meaning. Because my study analyzes these students at several points of their journeys I have developed three distinct terms for clarity of reference. I will use ‘Returnee’ to refer to the Chinese students who have left the country *and* returned to China. I will use ‘Overseas Chinese’ to refer to students who have left the country and are yet to return to China. This group includes both students who intend to repatriate and who do not plan to return. Finally, towards the end of my thesis, I will rely on the word ‘Overseas Returnee’ to capture the pattern of Chinese who were once Returnees (returned to China) but left again subsequently because Chinese society did not offer them what they needed.

The evolution of Returnees has received a significant amount of scholarly attention: however discussion remains limited on the future impact of Returnees on Chinese society. Prior research on Returnees examines their evolution, motives, and roles, of Chinese sea turtles across the past few decades (Zweig & Robertson, 2006), the economic effects of sea turtles on the Chinese Economy (Zweig & Robertson, 2006; China Daily, 6.25.2004, China’s Brain Drain, the Brain Diaspora) and their re-integration process of Returnees back into Chinese society (China Daily).

Scholarship on the evolution of Returnees examines the historical trends and changes in their composition and characteristics of Returnees. The characteristics of today’s Returnees and overseas Chinese are different than the original of the 1970s and 1980s Returnees, whose international movement provided the model for the pattern. Historically, only the best and

brightest students won merit scholarships that afforded them the opportunity to study in the West (China Economic Review, 2010). These students were considered *dujin*, to be "coated in gold." Now, due to the recent economic boom and rising middle class, an increased number of students can study abroad; according to the Far Eastern Economic Review, roughly 60% of Overseas Chinese are paying full tuition at US institutions (Zweig & Robertson, 2006).

The literature examining the economic effects of repatriation highlights the social problems caused by the influx of Returnees. Firstly, many Returnees are struggling to find work for wages comparable to those paid in the US (Zweig & Robertson 2006). As many Returnees face this challenge, several problems are occurring. For example, many parents have invested their entire life savings in their child's education and studies, expecting future pay-off and rewards (Zweig & Robertson, 2006). If their children cannot find employment, not only can the parents not support the child, but also parental expectations for support from their children are disappointed.

Literature on re-integration processes focuses on government policies towards Chinese Returnees. Research by Zweig and Robertson (2006) examines the different incentives local governments provide to entice Overseas Chinese to repatriate. They identify incentives such as housing discounts, office space, jobs for spouses, international schools for children, and resident permits (Zweig & Robertson, 2006). Cities compete fiercely to recruit returning talent; Beijing and Shanghai, for instance, both have 14 city zones dedicated to helping Returnees develop businesses and navigate government policies, and several other cities do likewise (Zweig & Robertson, 2006). In addition, in 2007, the China Development Bank created a fund of 2.5 billion Yuan (roughly 320.5 million USD in 2007) to fund Returnees interested in starting new domestic ventures (Bell, 2007).

In general, the scholarship on Returnees is written after 1990. It has increased in concentration over the last ten years as China has become a global power, thereby making the “sea-turtle” phenomenon globally relevant. It sits as a key issue for assessing the future of China’s economic growth.

Because I am interested in the roles that Returnees play in China’s current policies, my study also relies on innovation scholarship. Within the innovation literature I focus on sources that examine regional and international frameworks for stimulating innovation, provide histories of China’s innovation and policy structure, and offer recent analyses of the success of entrepreneurs on the mainland.

One section of relevant literature focuses on stimulating innovation in emerging markets. More specifically this literature examines how Asian countries (Japan, Korea, Taiwan, China, India) have built economies of innovation that can rival Western powers. In particular, this literature draws parallels between China’s burgeoning economy and the different market-based and government procurement stimulus techniques used by its neighboring countries (Changhui & Jing 2008; Johnson 2008). A study from the UN (Yusuf 2009) offers an interesting template for how creativity is transformed into a market invention, on which I draw heavily in my second chapter.

Sources on China’s formation of intellectual property laws (Liu 2009) provide an excellent foundation for understanding the relative newness of intellectual property in China. Moreover, government documents on different policies and initiatives after China’s entrance into the World Trade Organization in 2003 offer perspective on how the government is integrating its own goal of ‘indigenous innovation’ within the framework of these international intellectual property standards (Earnst 2011; Frisbie 2007; Levy 2011).

Finally, studies of the links between different entrepreneurs highlights the role of cooperation among local firms, foreign firms, and local firms with foreigners (Leifner & Zeng 2008) as well as the development of entrepreneurship in China (Li et al 2010; Wang et al 2010).

My work combines literature on Returnee history and Returnee entrepreneurship with an analysis of China's current innovation policies. Combining these areas of scholarship demonstrates the crucial role that Chinese Returnees play in the new innovations that are produced daily in China. Currently China is the number one filer of patents, filing 435,608 patents in 2011 (WIPO website). Throughout my study, I examine the changes in business innovation and entrepreneurship across the past twenty years, and what role Returnees are now playing in these phenomena. Returnees are at a unique vantage point to understand both the catalysts for and strengths of innovation; they exist in a separate domain where they navigate the social, economic and educational differences of two different worlds. As a result they are, in equal parts, receptive to both Chinese and Western values and affected by both Chinese and Western policies.

In Chapter One I analyze three historical phenomena that have limited China's capacity for innovation. Although the events have passed, their effects have not: modern Chinese society continues to be shaped by their impact. Through assessing the role of Confucianism, government protectionism, and the Cultural Revolution, the first half of this chapter will provide the background behind to China's entry into the 21<sup>st</sup> century lacking innovation and desperate to catch up. The second half of the chapter examines the initial trends in Returnees. It focuses on the correlation between government policies and incentives and the increased emigration of Chinese scholars, as well as the role of this first wave of Returnees in helping the nation to



progress quickly. Across the 1980s and 1990s these Returnees offered a ‘quick-fix’ for the decades of isolation from which China was emerging.

Chapter Two analyzes the effect of China’s 2006 Medium to Long Range plans, which aim to create an economy of ‘indigenous innovation’ by 2020. Here I will explore four key drivers (incentives, institutions, financing, urban environment) of innovation in the context of Chinese society. Through a close analysis of the incentives, institutions, financing and urban environment that exist in China I determine the role that each factor is playing in driving or hampering the goal of this 2006 policy. I conclude the second chapter with an analysis of patent filings and grants in China over the past two decades. China’s intellectual property has historically been foreign-owned. However here I argue that domestic residents, many of whom have studied abroad, increasingly own China’s intellectual property.

Finally, Chapter Three examines the newest trends in Returnees, which have yet to surface in the scholarship. This chapter relies on available government statistics, personal surveys and interviews, and recent newspaper articles. Data was challenging to find and unfortunately the Chinese government does not always provide reliable numbers. Nonetheless, by cross-referencing many sources, I have been able to piece together an understanding of the modern Returnee. In this chapter I argue that several new trends exist: more Overseas Chinese desire to stay abroad than ever before; many Returnees who repatriate to China are struggling to find work; and many Returnees have turned to entrepreneurial ventures as a solution. This chapter also brings up two parallel phenomena: the increase in American colleges reliance on Chinese students’ tuition in order to fund their universities and the recent exodus of wealth from China. I see both of these phenomena as an effect of Returnees in modern Chinese society.

Finally I conclude that Returnees are impacting China's future growth by returning to China and then subsequently leaving. They are rapidly becoming Overseas Returnees. Moreover, although Returnees originally remedied China's need for indigenous innovation, future change will need to be systemic. A change in the education system and in the strict belief of Confucian values must ultimately become part of the solution to create a more innovative economy. Finally, in my conclusion I experiment with the idea of an American Returnee.

My thesis relies on both primary and secondary sources to evaluate and understand the historical groundings of Returnees and of Chinese innovation. In addition to the significant body of scholarship that already exists on Returnees, I have conducted my own surveys of Chinese students affiliated with the Duke community and Chinese employees in the Research Triangle Park area. This data allows for a qualitative analysis of the current outlook the many overseas Chinese hold and the reasoning behind the repatriation decisions that many Overseas Chinese face when they graduate. I have also turned to Chinese sources including newspaper articles and publicized interviews with different Returnees in order to gain an understanding of these issues. Finally, I had the opportunity to travel to Shanghai over the winter break. While there I conducted interviews with a few Returnees who provide perspective on the current situation in China.

This project will add to the existing literature on Returnees and innovation, while also hoping to bridge two fields. Within the field of Returnees my research adds current data about the attitudes of Overseas Chinese, as well as the changing role of Returnees in Chinese society. Likewise, within the discipline of Chinese innovation literature, my project is one of the only studies linking the role of Returnees to China's current innovation policies. My hope is to bring these two fields in dialogue in order to determine the role of human capital in innovation. More

specifically, I hope to determine where Chinese Returnees exist within China's new policies of indigenous innovation: Do they bridge the fields of Returnee research and innovation studies? Do Returnees serve as a catalyst for innovation? Or are they simply an effect of a changing global paradigm?

## **Chapter One: Historical Legacies and Innovative Tendencies**

Between the time of China's four great inventions (paper, compass, gunpowder, printing) and the innovation policies of the recent decade, several events have shaped Chinese attitudes towards innovation and creativity. To contextualize the situation China faces today we can look to three phenomena: traditional legacies of Confucianism, government policies of protectionism, and the Cultural Revolution, all of which have built the foundation for China's current innovation conundrum.

Confucian values dictated traditional Chinese culture, and several of its tenets limited the spread of innovation in ancient China. First, at its foundation, Confucianism condemns profits, rebuking monetary gains on behalf of another individual (Liu 2009: 122). Immediately, one can see how disdaining the seeking of profits directly hinders the formation of patent laws which both protect one's proprietary secrets and also one's ability to profit from an idea.

This disdain for profit also led to a social hierarchy that indirectly retarded the development of innovation. The Confucian social system, which prevailed through most of ancient China, placed scholars at the highest level, followed by farmers, artisans, and merchants. Merchants were placed on the bottom of the Confucian hierarchy because they sought profit. Moreover, the government supported this hierarchy, particularly the lowly placement of merchants, for its own selfish motives: the government sought to prevent private hands from gaining overwhelming economic power (Liu 2009: 125). Despite government disapproval of the merchant class and strict government policies that aimed to limit and eliminate trade, trade

prospered throughout ancient China (see Liu 2009: 126).<sup>2</sup> Furthermore, the government routinely prevented merchants from buying land, despite the massive wealth many merchants had amassed, thereby impeding their ability to rise up the ranks and become government officials (Lu 1988: 49, cited in Liu 2009: 125I).<sup>3</sup> The government's support of Confucianism only strengthened the limiting effects it had on innovation.

Another roadblock to innovation was Confucianism's goal of cultivating "superior men" (Baark 2007: 343). Although this preference could ostensibly nurture innovation, in ancient China becoming a scholar was driven by employment (Baark 2007: 344). Scholars in China were expected to "silently treasure" their knowledge (Baark 2007: 343). Furthermore Confucianism placed a strong emphasis on consensus and uniform understanding (Baark 2007: 344), so scholars were not encouraged to debate their ideas, but rather to individualistically assert their viewpoints.

Confucianism's greatest impact on Chinese society came through its implementation of the Imperial Examination Systems (IES). The IES had long been the quickest way to success in China. It began during the Sui Dynasty around the year 605 and flourished throughout Chinese history until its demise in 1905<sup>4</sup>. The Imperial Exam was seen as the only way to achieve upward social mobility if one was poor; it served the purpose of reducing the power of

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<sup>2</sup> The first record of large businesses is during the Han Dynasty (FitzGerald 1976, p. 162-165, cited in Liu 2009, p. 126).

<sup>3</sup> Liu argues that the failure of the merchant class to rise up to power stunted the growth of a patent system. Liu attributes the rise of the European merchant class to the establishment of Europe's patent law and formation of legal protection for business ideas. According to Liu, merchants are driven by power, finance and the development of new means of trade and production, thereby making them the perfect impetus for innovation. For more see Liu (2009) p.128 – 129.

<sup>4</sup> The imperial examination system was first abolished at the beginning of the Yuan dynasty in 1271, however it was soon reinstated in 1315; and then abolished and re-instated several more times towards the end of the 19<sup>th</sup> century due to pressure to develop a national school system in the 1890's and the Hundred Days Reform in 1898.

aristocratic families that threatened the Imperial government (Yu, L. & Suen, H.K. 2005: 25).

Regardless of social status, if one passed the Imperial Exam one became a high-ranking government official, providing wealth, power and prestige not only for one's living kin but also for one's descendants. In order to pass the exam, test takers were required to have practically memorized many of the Confucian texts. This requirement inadvertently started a long trend of education via rote learning, a methodology that became the foundation of the Chinese education system.<sup>5</sup>

In addition to the effects of the Civil Service Exam on Ancient China, the government policies of protectionism have limited the ability of Chinese citizens to exchange ideas with foreign sources. Different dynasties often enacted policies limiting the movements of foreigners and locals alike. Policies discouraged the import of foreign technology or business competition by foreigners. In a famous speech, Emperor Qianlong of the Qing dynasty allegedly told King George III of England that China had “no use for [his] country's manufacturers” (as cited in Toynbee 1934: 161, cited in Liu 2009: 121). The lack of foreign competition directly impeded the development of intellectual property rights and patent policies. Intellectual property rights are fundamental not only for protecting local invention, but also because they attract new technological innovation, which provides that competition required for local innovation to evolve. In short, the lack of foreign competition stunted ancient society's innovation capacity.

Interaction with foreign ideas is essential to innovation; it is why China's government invests significant time and money to recruit Overseas Chinese to return to the country,

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<sup>5</sup> Due to education reforms that challenged the IES in the early 20<sup>th</sup> century as well as the fall of the Qing Dynasty in 1911, other avenues for success began to emerge. As a result, the national exam no longer dictated social mobility.

something I expand upon later in Chapter One. In short, the lack of foreign competition stunted ancient society's innovation capacity.

Although the Chinese government protected foreign technologies from entering China, the reverse was not true. Many foreign governments encouraged the importation of Chinese technologies, both by replicating the production of Chinese goods and also by attracting scientists, skilled artisans and other citizens hoping to flee the country due to various periods of economic and political instability (Liu 2009: 129).

Although a few Chinese did flee, the Chinese government strongly discouraged its citizens from leaving the country. Confucian values dictate that children should remain close to home to care for their elders, and throughout Chinese history the government has actively dissuaded citizens from emigrating, for fear of losing the local talent needed to drive much of China's growth and development. During the Tang dynasty (618AD -- 908 AD), citizens who left China risked official prosecution; and in the Qing dynasty (1616AD – 1911 AD), the government not only prohibited emigration, but also threatened to execute those who returned back to China secretly, a law that remained intact until the late 19<sup>th</sup> century (Li, J.; Young, Michael, N.; Tang, Guiyao, 2010: 376). Furthermore, during the Ming dynasty prohibitions constrained the emigration of Chinese overseas and the free movement of foreigners within the nation (Liu 2009: 129). Despite the government's Draconian restrictions, many Chinese escaped to overseas, developing markets and exporting their technological skills (Liu 2009: 131).

### *Entering a Global Environment*

Given the long history of emigration constraints and the traditional Chinese culture that quashed innovation, it is surprising Chinese entrepreneurship ever developed. Yet, towards the

beginning of the 19<sup>th</sup> century trade between Western powers and South East Asia blossomed, providing local Chinese with the opportunities for overseas ventures in these countries. This trend would become the main catalyst for Chinese entrepreneurship. Political instability spurred trade in China throughout the 19<sup>th</sup> century, due to threats by foreign powers (Li, J.; Young, Michael, N.; Tang, Guiyao 2010: 371). The main conflicts between China and Western powers throughout the 19<sup>th</sup> century include the First Opium War in 1840, the Treaty of Nanjing in 1842, which ceded Hong Kong to the British and legalized the importation of opium, a series of ‘unequal treaties’, which carved spheres of influence within China for numerous foreign powers and finally, the Sino-Japanese War in 1894-1895, which led to the presence of Japan in Eastern China.

Chinese ethnic<sup>6</sup> communities seized the opportunities created by the tumultuous internal atmosphere to develop business relationships with foreign powers. These communities were enjoyed social mobility and created economic success through a series of established entrepreneurial ventures. Ethnic communities located in southern China established lucrative businesses by serving as the middlemen between the Western merchants and local Chinese. Due to their great success these communities amassed significant wealth; in 1955, Chinese ethnic entrepreneurs controlled 70% of all retail trade in Indonesia and Thailand, 75% in the Philippines and 85% in Malaysia (Li, J.; Young, Michael, N.; Tang, Guiyao, 2010: 373). Ethnic Chinese also controlled many of the banks in South East Asia, including the largest regional bank, the Bangkok Bank (Li, J.; Young, Michael, N.; Tang, Guiyao, 2010: 373).

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<sup>6</sup> I use the word ‘ethnic’ from its Chinese derivation 少数民族, literally meaning small percentage and ethnic minority. The phrase refers to any Chinese person who is not of Han descent. Han Chinese currently represent around 91.5% of the population, with 55 other ethnic groups representing the remaining 8.5%. Many of these groups still reside in southern China today.



At the end of the Second World War, Western powers finally withdrew from China, hindering the established trading businesses of ethnic Chinese but making space for new industries. It was these early ethnic communities who diversified their businesses and became the mainland's first entrepreneurs. They capitalized on China's resources, creating businesses in rice milling, tin dredging, and rubber processing (Li, J.; Young, Michael, N.; Tang, Guiyao, 2010: 373). Their businesses, which were accelerated by China's urban growth and rapid expansion, encouraged more Chinese citizens to enter the market, and created new opportunities in industries such as manufacturing, real estate and financial services (Li, J.; Young, Michael, N.; Tang, Guiyao, 2010: 371).

However, internal instability began to plague China throughout the 1960s and 1970s. The Cultural Revolution, which officially lasted from 1966-1976, retarded Chinese society. It sought to overturn the bourgeois academic elite, give power back to the proletariat, and restore socialism to a nation that had recently shown signs of the takeoff of capitalism. During the Cultural Revolution, China's chairman at the time, Mao Zedong, instituted a large-scale class struggle and socio-political cleansing that resulted in the death of over 50,000,000 people, making it the largest killing of the 20th century.

The Cultural Revolution had immense social impact. All educational institutions were closed and the Chinese college exam was not administered for 11 years. Academics were sent to the countryside to work in fields; they were re-educated, publically humiliated, beaten and arrested and often never seen again. Despite the official end of the Cultural Revolution in 1976, systematic measurements of education did not resume until the 1980's, at which point several provinces in China recorded above a 20% illiteracy rate. The reforms of the Cultural Revolution ruined China's education system.

While the policies of Confucianism and the Cultural Revolution have contradictory attitudes towards acquisition of knowledge, they both played a similar role in the development of Chinese society. The spread of Confucianism led to a culture that lacked competitiveness, discouraged risk taking, and dampened the desire to innovate. Similarly, the Cultural Revolution decimated the society by creating wide spread illiteracy and making China uncompetitive on a global stage for almost the next two decades.

At the end of the Cultural Revolution, Chinese authorities were left with a society of agricultural communes and an illiterate populace. In order to enhance China's link to the world economy, the Chinese government urged communities to create Township and Village Enterprises (TVEs). Towards the end of the 1970s hundreds of TVEs were enacted; their main purpose was to attract foreign direct investment and foreign capital to the region (Fan 2008: 3). The TVEs were the predecessor of the Special Economic Zone (SEZ), an institution that similarly aimed to attract foreign capital. SEZs will be discussed more in Chapter Two.

In the 1980's the government created a National Innovation Systems (NIS) that focused on separating commercial innovation research (e.g. research that directly benefited State Owned Enterprises) and scientific innovation for research institutes (Xue 1997, cited in Fan 2008: 9). However, over time the Chinese government has pushed the R&D institutes to cater to the innovation needs of the industrial sector by decreasing the funding for research institutes and universities and by providing incentives for the commercialization of R&D developments (Fan 2008: 9). Through these changes the government created an innovation system focused on achieving market-based results. Unintentionally, the government has directly instilled a notion of innovation based on achieving deliverables rather than on risk-taking and supporting creative ventures.

Having a strong patent law is essential to protecting inventions and stimulating innovation. Since the Cultural Revolution, the Chinese government has created many initiatives to strengthen its patent system, including its policies surrounding Returnees. Although China's patent law has developed slowly, the State has finally begun to develop systems for intellectual property protection during the last half century. In the mid-eighties, China publicized its first international patent law, the Chinese Patent Law of 1984. The government enacted the law to structure its new economy and to necessitate a more capitalist economic behavior from its businesses. Although businesses embrace the law, the relics of Maoism and the large geographical size of the country often hinder its execution (Liu 2009: 124). Subsequent amendments to the law in 2000 (WIPO: China) demonstrate the government's commitment to creating a legal foundation that can accompany the implementation of its policies.

### **Solving the Innovation Gap: The Promise of Human Capital**

#### *The Rise of Returnees*

Faced with a fragile legal structure, a decimated education system and a highly illiterate population, the government turned to a 'quick-fix' solution to these problems. Instead of implementing systemic changes, the government focused its efforts on the potential of Returnees to strengthen the nation. This proved to be quick, but brought along complications, many of which I will explore in Chapter Three.

Towards the end of the twentieth century the Chinese government began awarding merit scholarships for the brightest scholars to study abroad. In 1979, Deng Xiaoping, China's then Chairman, encouraged the Education Commission together with the Chinese Academy of Sciences (CAS) to send 3000 Chinese students abroad for five years each (Wang, H.; D. Zweig;

et al. 2011: 217). The initiative was driven by the government's desire to remedy China's dearth of students educated and interested in science and technology. The government believed that letting people go abroad and learn in a foreign environment would enable China to reap the benefits of foreign scientific discoveries and innovations; however, they also recognized the challenge would be competing with other nations for the return of their human capital (Zweig Impact 2006: 66). The Chinese Ministry of Education, which oversees and administers the majority of policies related to international exchange, explains its mission as follows:

Before the foundation of the People's Republic of China, there were already a lot of Chinese going abroad for further studies in order to bring home knowledge that could help build a stronger country. After the establishment of new China, bearing in mind the ideas of fighting against the capitalist Western Bloc and speeding up the development of a socialist country, the Communist Party of China (CPC) and the central government decided to send students and scholars to the former Soviet Union and other socialist countries to study the advanced S&T and management skills. Beginning from the 1960s, with the change of international political climate, the central government accordingly made adjustments in policies related to sending students and scholars abroad. In 1978, with strategic insight, late Chinese leader Deng Xiaoping made the important decision of expanding the scales of sending students and scholars abroad. Based on the past experience, in 1992, the CPC Central Committee and central government promulgated the guideline for students and scholars studying abroad, that is---to support students and scholars studying abroad, to encourage them to return to China after their completion of studies and guarantee them the freedom of coming and going. (<http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/s3917/201007/91574.html>)

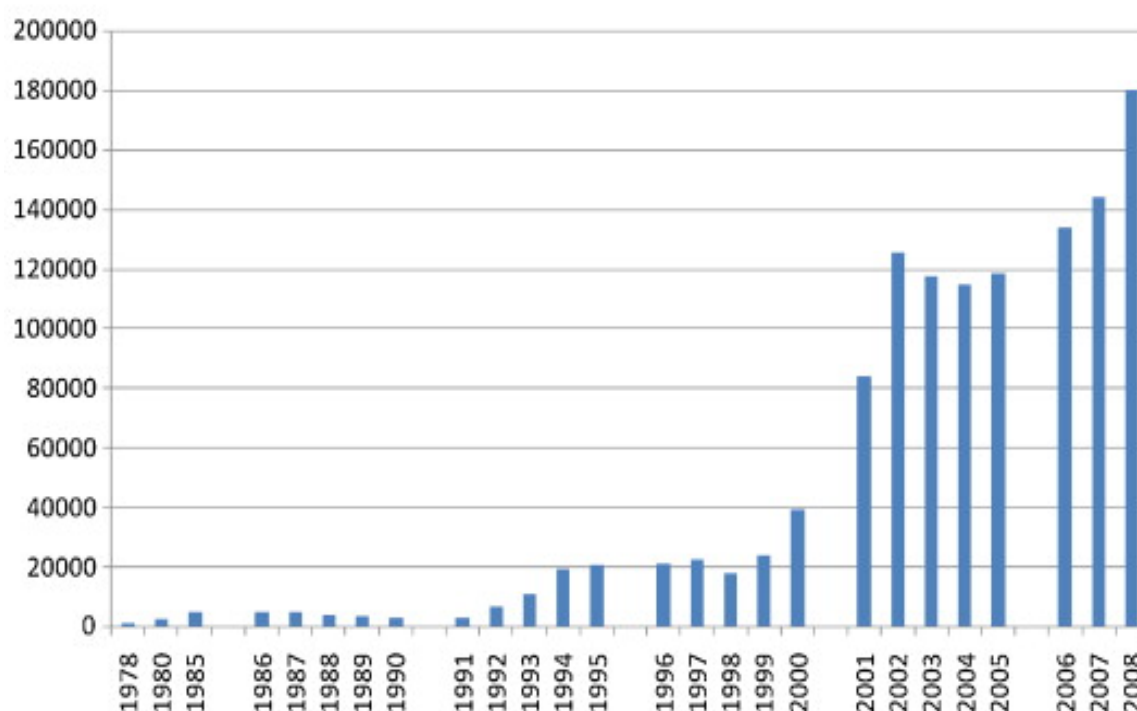
Figure 1 in the appendix shows the different organizations with the Ministry of Education dedicated to sending Chinese scholars abroad. Within this one ministry there are many divisions focused on international exchange. In addition to the MOE, the Chinese Academy of Science and the Ministry of Science and Technology also devote resources to funding Chinese students and attracting overseas Chinese to return home. The ministries are all very fragmented, and many

have their own motives. Figure two in the appendix lists the different education-related policies passed by different ministries over the past twenty years.

While the original government sponsorship was for visiting scholars, who had little ability to acquire a longer visa, as interest in going abroad expanded, the government provided opportunities for students to stay abroad longer. Throughout the 1990's the annual return rate of these scholars barely hit 13% (Zweig, D., 2006: 66) due to strict government policies and mistrust of the government. A few years later, however, in 2001 and 2002 it rose drastically, exceeding 45% annually (Zweig, D.; C. S. Fung; Han, D., 2008: 2). The chart below illustrates the sharp increase in the volume of Returnees since the turn of the century. It is important to note, that due to increased globalization and mobility, far more Chinese students are going abroad, yet the *rate* of Returnees has remained fairly stagnant (Zweig, D., 2006: 65).

**Figure 1.1: Returnees By Year**

(data source: Chinese Ministry of Education)



In the thirty years since the first formal government-sponsored program, the Ministry of Education has sent 1.21 million students abroad, with an average return rate of 25%.<sup>7</sup> Each year Chinese government policies strongly influence the rate of Returnees. For example, on the graph above the lower number of Returnees during the late 1980's reflects internal turmoil. First, in 1986 student protested against Deng Xiao Ping's policies; they advocated for increased study abroad privileges and exposure to Western pop culture, among other demands. Meanwhile, the government criticized the General Secretary Zhao Ziyang for the proliferation of Western influences. Despite these unrests it was not until June 4<sup>th</sup> 1989 that China faced a major internal threat to its Returnees. The Tiananmen Square massacre<sup>8</sup> only reaffirmed many students' desires to stay abroad; and the internal atmosphere of state oppression that resembled the Cultural Revolution caused many Returnees to vow they would never go back (Zweig 2006: 68). More recently, the reaction of the Chinese government over political prisoner Liu Xiaobo's winning of the Nobel Peace Prize for his work in human activism has continued to increase the frustration of many Chinese abroad.<sup>9</sup> Likewise, the revelations over the corruption and murders instigated by Bo XiLai<sup>10</sup>, a senior Communist Party leader indicate an economy still facing political turmoil. (Johnson, I.: 1).

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<sup>7</sup> The Ministry of education reports that from the end of 1978 to the end of 2007, only 319,700 of the 1.21 million students who studied abroad returned (Wang, H., D. Zweig, et al.: 2011).

<sup>8</sup> The June 4<sup>th</sup> 1989 protests were named the Tiananmen Square Massacre after the People's Liberation Army openly fired on student protesters in Tiananmen Square, outside the capital building. The total death report is unknown, but estimates range from hundreds to thousands. Following the shootings, the government continued to arrest and detain people who spoke out against the Party.

<sup>9</sup> Liu Xiaobo was awarded the Nobel peace prize in 2010 for his long-term advocacy of human rights in China. He is the first Chinese citizen residing in China to ever win the award. Liu was imprisoned by the Chinese government for his human-rights work and was not able to attend the ceremonies or receive the award in person.

<sup>10</sup> Bo was a top-ranking communist official and a likely candidate for the 2012 Politburo Standing Committee. Shortly before elections Bo was revealed to have been implicit in the

### *Government Policies towards Returnees*

During the past two decades Chinese leaders have publically recognized the dilemma surrounding the high rates of overseas Chinese (OCs) compared to the low rates of Returnees. The government has acknowledged that on one hand, allowing its citizens to stay abroad provides easier access to Western technology; however, attempting to attract them back has proved to be challenging.

Jiang Zemin's famous motto: "*ke jiao xing guo*" – "strengthening the country through science and education", became the slogan of the government towards education during the 80s and 90s. Heeding Jiang's slogan and wary of Tiananmen Square, Deng Xiaoping issued several decrees in 1991 promising students abroad that the climate of China had indeed changed. In 1992, China's Academy of Social Sciences (CASS) encouraged the Chinese government to translate into Chinese the research of OCs who did not intend to return right away. By sharing their knowledge back home they were 'serving the country' as Deng Xiaoping had encouraged (Zweig, D., C. S. Fung, Han, D., 2008, 5). However, this policy alone was not sufficient. Deng enacted the first incentive policy in 1992. The policy had four pillars (Zweig, D.; C. S. Fung; Han, D., 2008, 68):

- 1) Creating new centers focused on employment for returned students in Shenzhen, Shanghai and Fujian.<sup>11</sup>

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murder of a British businessman in China. The news reaffirmed the corruption in the Communist party, as well as highlighted certain divisions among party figures.

<sup>11</sup> This complemented the thirty-three "Overseas Study Service Centers" in twenty-seven different provinces and cities that the government had created in 1989 to help facilitate the job searching of returnees (Zweig 2006: 73).

- 2) Special policies (a) giving Returnees management positions and more living space  
(b) giving family members the opportunity to follow the Returnee (c) increasing job mobility for students who signed contracts with their research centers
- 3) Creating a national association for returned students
- 4) Allocating more support for scientific research

These incentives, referred to as “preferential policies”, would be the first of many enacted by the Chinese government to encourage OCs to return. The incentives of 1992 had one major effect. Before the law, OCs who wished to return to China were required to return to their hometown. OCs who grew up in rural communities were often discouraged by the lack of resources provided by their hometown. By allowing Returnees to work in any city, the 1992 incentive policy created a new talent market (Zweig 2006: 69). The policy promised significant economic advantages for Returnees who brought back new technology, including higher wages and increased government funding for their new ventures.

In addition to the incentive policies, the government also established another more short-term initiative under the Spring Light Program. This policy allowed scholars to return to China for six-month periods, giving OCs a taste of the ‘new’ China, which the government hoped would permanently attract them back. By 1995 the Ministry of Education helped 1200 people return through this initiative (Zweig 2006: 74). In the following years, programs funded by the Ministry of Education under this platform would successfully bring back thousands more OCs permanently.

Three other changes during the following decade significantly shaped China’s internal climate. Firstly, in 1998 when the Chinese government passed “Project 985”, an initiative that restructured China’s higher education system, creating world-class universities devoted to



research and cultural exchange. The first phase of the initiative called for billions of Chinese Yuan to be invested in nine universities. Lack of investments in higher education and research centers, was one of the major reasons OCs cited to not return.<sup>12</sup> The program specifically emphasized two universities in Beijing and led to the construction of several world-class research centers and facilities.

The second major shift happened a year later in 1999 when the National People's Congress acknowledged that the private sector was integral to the national economy. Previously, the government had only recognized state-owned-enterprises (SOEs), intentionally hindering all private business that attained a certain level of success. The new edict provided relief and security to Returnees interested in starting a business in China.

Finally, China's entrance into the World Trade Organization in 2001 led to many internal changes, particularly to an increase of multinational corporations (MNCs) in China. These MNCs, in turn, brought about the need for local talent to staff their firms. Many Returnees, who possessed Western experience and training, eagerly returned to China to take on higher management roles in these organizations.

Likewise, the maturation of the "lost generation", the generation composed of citizens age 10 – 25 during the Cultural Revolution, led to a human capital gap in China. Many of these students missed critical years of education and could not compete with s or younger Chinese students. The "lost generation" is devoid of global awareness as well as management and leadership skills. Few Chinese firms had the structure and resources to invest and develop in training employees. Instead, they hoped to attract back Overseas Chinese who could fill middle-management positions. In Chapter Three, I expand upon the re-integration process of these

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<sup>12</sup> This continues to be a strong complaint among OCs hoping to return. I will discuss this further in my Chapter 2: The Repatriation Decision.

Returnees.

It is important to note, that the effort to attract Returnees extended beyond government to private universities and business as well. When the government decentralized its control over educational exchanges in 1985 (Zweig 2006: 76), universities and research organizations began to actively recruit talented Returnees. Before the aforementioned 1992 incentive policies, the Ministry of Education and the Chinese Academy of Sciences were the only two organizations responsible for selecting and sending Chinese students abroad. As a result, they had retained a tight monopoly on Returnees. Since 1992, elite Chinese colleges have begun encouraging scholars to both study abroad and return to China to capitalize on their knowledge acquired abroad.

Until the key incentives from government in the early 2000s, research labs and universities provided the main impetus for returning.<sup>13</sup> However the rise of globalization and China's adoption of a capitalist economy have transitioned the awarding of incentives away from stimulating scientific and engineering research alone; China's marketplace now provides the best venue for Returnee entrepreneurs to capitalize on their new knowledge and experiences. The economy particularly rewards innovations that can be commercialized (Zweig, 3). The increased volume of Returnees combined with intense globalization has also led to competition between Returnees and natives for similar jobs (something I will expand on in Chapter 3).

In this chapter I have only mentioned a few of the many policies implemented by the Chinese government to attract returning talent from abroad. Figure 2 in the Appendix provides a more detailed list of the policies enacted between 1989 and 2007.

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<sup>13</sup> This was strongly influenced by the extreme lack of publishing that China faced in the 1980s and 1990s. Using data on the birthdates of Chinese scientists in the late 1990's, research by Zweig et al. shows that there is dearth of publishing in the scientific community between students ages 28 to 36 (Zweig, D.; Fung, C. S.; Han, D., 2008: 2).

*Who Were China's First Returnees?*

Overseas Returnees have played an important role in China's history. The first recorded group of Returnees are said to have returned to China around the turn of the nineteenth century. It included engineers, naval commanders, and even a prime minister (LaFargue, T., 1987; Huang, H., 2002 & Han, D. and D. Zweig: 2008). The two leaders of the Nationalist<sup>14</sup> party, Sun Yatsen and Chiang Kaishek respectively both studied abroad<sup>15</sup>, as well as the main activists in China's New Youth movement, Chen Duxiu and Li Dazhao. Recent leaders of the Communist party including Deng Xiaoping and Zhou Enlai have also spent time abroad. Within the 16<sup>th</sup> CCP Central Committee, the 2002 body of congress, Returnees accounted for nine full seats and thirteen alternate seats, comprising 4.5 percent and 8.2 percent respectively (Han, D.; Zweig, D., 2008: 1). During that same time, roughly 5 percent of provincial leaders claimed overseas experience, as did 13 percent of government ministers (Han, D.; Zweig, D., 2008: 1). The 2012 Politburo Standing Committee, which represents the Chinese congress, is comprised of seven members, who have studied outside of China in countries ranging from America to North Korea. Moreover, among the seven leaders there are strong connections to US universities. Xi Jinping, China's top leader, has a daughter who currently attended Harvard College; and two party leaders, Zhao Ziyang and Jiang Zemin, have grandchildren who attended Harvard (Dobson 2012: 2).

Returnees have been crucial to China's political and economic growth across the past half-century. However, they are even more important today due to problems of innovation facing

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<sup>14</sup> The Nationalist party was founded by Sun Yatsen and Song Jiaoren in 1894. It professed nationalist principles and a republican government. It successfully overthrew the Qing dynasty in 1911. It is still the ruling party of Taiwan.

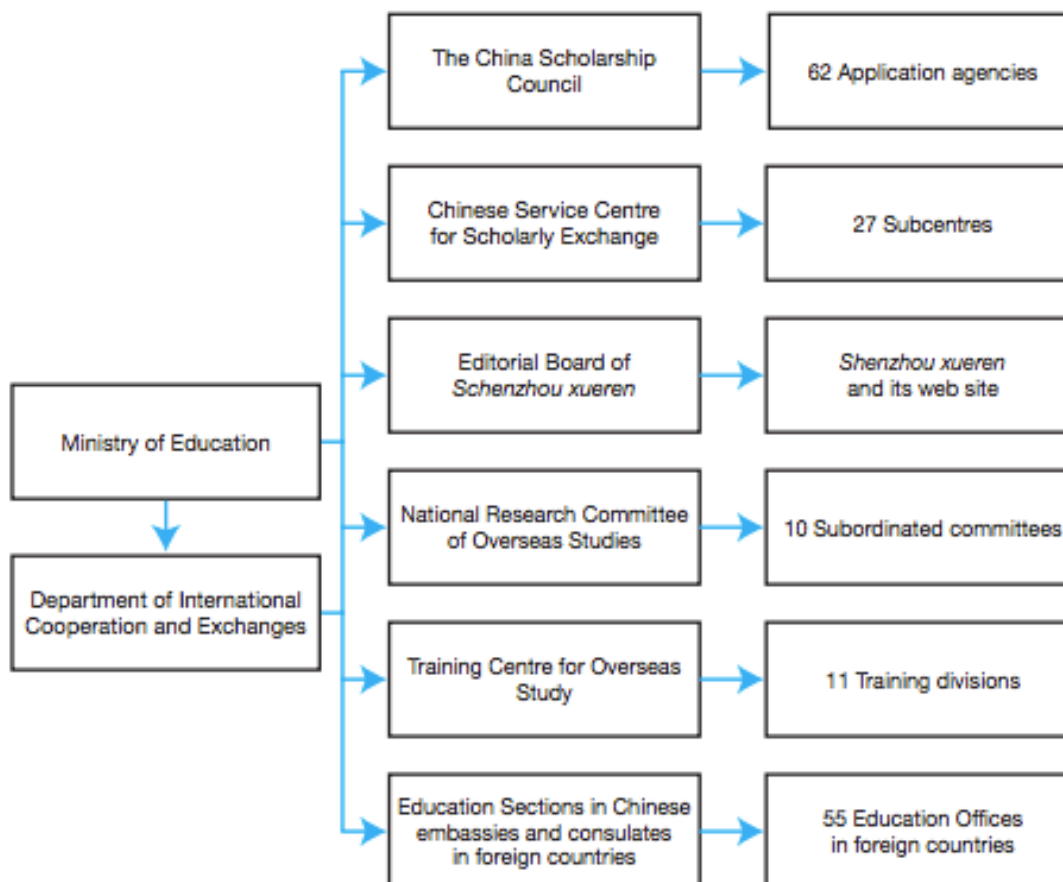
<sup>15</sup> Sun Yat-sen attended the 'Iolani school in Honolulu, Hawaii, where his brother lived; he then later studied at the Hong Kong School of Medicine for Chinese. Chiang Kaishek studied at the Military Academy in Japan.

the Chinese government. In the next chapter I will examine the roots of China's current innovation situation, analyze the Chinese government's recent policies aimed at addressing this situation, and finally assess the government's view on the role of Returnees is helping to solve the problem.

## Appendix to Chapter One

MOE Organizations with programming meant to encourage Returnees

Figure 1.2: MOE Organization 1



Source: Zweig, D. (2006). "Competing for talent: China's strategies to reverse the brain drain". International Labour Review: 145(1-2), p 71.

**Table 1.1: Education Policies Towards Returnees from 1989-2011**

Mar 1989	No-name policy	Ministry of Personnel and State Education Commission	Established research centers to attract overseas PhDs to return for postdoctoral positions on the mainland.
Nov 1989	No-name policy	Ministry of Personnel	Younger Returnees and younger academics to be given preferential opportunities in jobs located at scientific and technological research institutions and at large and medium-sized state enterprises.
1990	The Fund for Returnees to Launch S&T Researches	State Education Commission	Established research funds that funded around 1,000 overseas Returnees every year.
Mar 1992		Ministry of Personnel	Job introduction centers for returned students established in Shenzhen, Shanghai, and Fujian; preferential policies given to Returnees, especially better living and working conditions; help in founding a national association of returned students; and providing great support for scientific research.
Aug 1992	No-name Policy	Ministry of Personnel and State Education Commission (Doc. 16)	Resurrect the effort to attract excellent PhDs to return for postdoctoral positions.
Aug 1992	Document 44	State Council	Document based on Deng's January 1992 speech, outlined the Communist Party's willingness to forgive Returnees who, while overseas, had criticized China over June 4 <sup>th</sup> events if they refrained from future political actions.
Jun 1993	Joint Circular on the Placement of Returned Student' Publication	Ministries of Personnel, Public Security and Commerce	'Joint Circular on the Placement of Returned Student' makes the key point that 'if some students want to move to other units, personnel departments should try to meet their requests'. Returnees allowed to apply for work in all areas of the economy or set up their own companies.
1993	Program for Training Talents toward the 21st Century	MOE	Targets outstanding young teachers from overseas. In its first decade it supported 10 batches of 922 people.
Nov 1993	New Slogan	Central Committee of	Twelve-point slogan: 'Support

		the CCP	overseas studies, encourage Returnees to China, grant the freedom to come and go'.
1994	'One Hundred Talents' program	Chinese Academy of Sciences	Established to attract 100 top young mainlanders overseas in the natural sciences to return before 1999.
Sep 1995	No-name policy	Ministry of Personnel	Ministry of Personnel will fund scientific research for excellent overseas Returnees.
1996	Chunhui 'Spring Bud' Project	Ministry of Education	The 'Spring Bud Project' gives financial support for people to return for short-term visits, with particular focus on doctoral students. The program has funded over 8000 people to visit the country short-term.
1998	One Hundred Talents Program	Chinese Academy of Sciences	Enlarges the 'One Hundred Talents' program, recruits 100 top scientists every year for three years.
1998	Chanhui 'Spring Bud' Project	Ministry of Education	Enlarges the 'Spring Bud Project'.
May 1998	985 Plan	President Jiang Zemin and Ministry of Education	Under the '985 Plan' to build world-class universities in China, the central government invests billions of RNB in nine universities, and 20 percent of the funds are allocated to hire overseas scholars
Aug 1998	Changjiang Scholar Incentive Program	Ministry of Education	The Changjiang Scholars Program offers funds to leading Chinese scientists living abroad to return for one year in strategic research areas
Jan 2001	No-name policy	Ministry of Personnel	New regulations on 'incubators' in high-tech zones for overseas returnees.
May 2001	Document 49	Ministries of Education, Science & Technology, Personnel, Finance and Public Security	'Serve the nation' without 'returning to the nation'; a policy to encourage Chinese who remain abroad to engage in seven types of activities that can help China.
Mar 2002	No-name Policy	Public Security Bureau, Foreign Ministry, Ministries of Education, Personnel, Labor, Foreign trade, Office of Overseas Chinese Affairs, etc.	Regulations that simplify entry and exit for highly talented mainlanders and investors holding overseas citizenship.
Aug 2002	No-name policy	Ministry of Personnel	Ministry of Personnel, along with local governments, builds up technology parks for overseas Returnees

Mar 2005	No-name policy	Ministries of Education, Science & Technology, Personnel, and Finance	Define what is 'top overseas talent', as future policies target this group
Nov 2006	11 <sup>th</sup> 5-Year Plan	Ministry of Personnel	Eleventh 'five year plan' for overseas Returnees
Feb 2007	No-name Policy	Ministries of Personnel, Education, Science & Technology, Finance, Foreign Affairs, Commerce, Public Security, National Development and Reform Commission, People's Bank, Chinese Academy of Sciences, State Assets Supervision and Administration Commission, State Taxation Bureau, China Customs, State Administration for Industry and Commerce.	Sets up 'green channel' for 'top overseas talent' to work in China; creates good domestic conditions for Returnees, makes entry for overseas Chinese easier.

Compiled from multiple sources. (Zweig, D., Fung, C. S., & Han, D. (2008). "Redefining the Brain Drain: China's 'Diaspora Option'". Science Technology Society: 13(1), pgs 7-9, Chinese Ministry of Education Website:

<http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/s3917/201007/91574.html>



## Chapter Two: Glossary of Acronyms

CAS	Chinese Academy of Science
FEI	Foreign Enterprise Investment
FI	Foreign Investment
KIP	Knowledge Innovation Program
MNC	Multi-national Corporation
MOST	Ministry of Science and Technology
MOE	Ministry of Education
PE	Private Equity
R&D	Research and Development
RDI	Research and Development Institutions
S&T	Science and Technology
SBIR	Small Business Innovation Research program
SBTT	Small Business Technology Transfer
VC	Venture Capital

## Chapter Two: From Imitation to Indigenous Innovation

### An Academic Perspective on Innovation

It is not easy to quantify innovation and its causes. As a result, significant scholarship exists on research surrounding the causes of innovation and metrics to assess it.<sup>16</sup> Scholarship outlines myriad ways to measure and identify innovation. The following examples provide a sample of the different ways in which innovation is discussed within academic discourse.

A policy expert at the East-West Center, Dieter Earnst, argues that there are different kinds of innovation. He divides innovation into *architectural* and *incremental innovation* (Earnst 2011: 2). Architectural innovations rely on existing technologies but change how the components interact; in short the innovation surrounds a new process. A great example of architectural innovation is Apple. Although Apple products do not revolutionize the technology of computing, they manipulate component interaction to create new aesthetics and façades for computer and phone products. In contrast, incremental innovations continually improve an existing product; they focus on a new product. Such improvements are often achieved through reverse engineering, or dismantling a product in order to understand the unique functions of each internal component. China is often criticized for its use of reverse engineering (Earnst 2011: 3). Finally, according to Earnst, ‘ideal’ innovation is a process that combines “enhanced productivity with welfare gains and environment-friendly technologies” (Earnst 2011: 2). This ideal sets a high

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<sup>16</sup> In fact, because it has become so difficult to measure innovation, a new discipline Wikinomics has developed. Wikinomics analyzes the effects of mass collaboration on innovation. The sudden growth of Wikinomics can be attributed to Anthony D Williams and Don Tapscott’s 2006 best-selling book titled *Wikinomics: How Mass Collaboration Changes Everything*.

goal, however it is encouraging to see a definition for innovation that combines financial and environmental gains.

Meanwhile, in a United Nations University Research paper, Peilei Fan avers that high-tech export, high-tech products developed and exported by a country, is a direct indicator of technological progress and thereby also serves as an indicator of innovation (Fan 2008: 4). High-tech export is often used to measure innovation in the Chinese economy, as it nicely complements Chinese government policies that argue for strengthening trade through increased science and technology.

Innovation can be measured through a firm's aptitude for adapting. A firm's ability to recognize, absorb and apply outside capabilities is essential to stimulating internal growth. Research by Cohen and Levinthal argues that there are two incentives which drive a firm's desire to learn: the quantity of knowledge that can be absorbed and the difficulty or easiness of the learning (Cohen & Levinthal 1990: 4). Based on these factors, firms must decide how much to invest in absorptive capacities. Leifner and Zeng, two innovation scholars who study the Chinese market, apply Cohen and Levinthal's research to the Chinese context. Leifner and Zeng argue that commercial innovation depends on both a firm's internal capabilities and the external environment. Internal capabilities include categories such as research and development (R&D) and employee competence (Leifner & Zeng 2008). Absorbing outside capabilities is essential to stimulating internal growth. In their survey of high-tech companies in Shanghai and Beijing, Leifner and Zeng further break down innovation along five stages: exchange of information, development of ideas, prototype development, pilot application, and market introduction (Leifner & Zeng, 2008: 251). These five stages allow us to see how innovation can move from an idea to a market-based commodity.

Some scholars make a further distinction between innovation and invention (Cohen 2002, Grasty 2012) is the entire market-based packaging of an invention. According to these scholars, innovation is the process through which invention becomes usable and market-ready. Tom Grasty, entrepreneur and founder of Stroome, a collaborative online and video editing and publishing platform explains “smart innovators frame their ideas to stress the ways in which a new concept is compatible with the existing market landscape, and their company's place in that marketplace” (Grasty 2012).

This is one place where Returnees offer significant advantages over local Chinese. Due to their experiences overseas, many Returnees understand the market audience and can help build consumer needs into the design. They can build an audience, market an invention, and prepare an invention for a globalized economy.

#### *Critical Areas of Consensus in Innovation Scholarship*

In the abundance of scholarship on innovation a couple areas of consensus do emerge. First and indisputably, innovation and specialization allow for greater productivity and economic success. Second, despite differences in methodologies for measuring innovation, most scholarship relies on *input* and *output* metrics to measure innovation. *Input* indicators include R&D expenditures, amount of human capital and financial investments, while *output* indicators include number of patents, publications, and sales. Investment is also considered an *output* metric because the ability of a firm to attract outside investment demonstrates that knowledgeable outsiders are willing to bet on the capabilities and success of a firm's products, skills, management, and technology. Investment is an important output indicator for Chinese firms, who are still in the *beta* process and have yet to produce measurable sales numbers. In

understanding innovation in the Chinese market, I will use this method of *input* and *output* indicators to assess the growth of innovation in China.

### **Creating a Knowledge-Based Economy: China's 2006 Innovation Policy**

Although innovation is crucial to any global economy, in the past two decades no country has publically placed more emphasis on creating an economy of innovation as China. Returnees are both a part of, and affected by China's innovation policies, particularly its 2006 Innovation Policy.

State-run initiatives on innovation date back to 1982, with the 'Key Technologies Research and Development Program'. This program represented the first public governmental recognition of China's need for innovation. Since the 1982 Key Technologies Research and Developmental Program, a handful of other policies have been influential in shaping the growth of innovation and sciences and technology (S&T) in China. For example, in 1995 Jiang Zemin gave a famous speech at the National Conference on Science and Technology, where he argued for "revitalizing the nation through science and education" (<http://mt.china-papers.com/3/?p=2911>). One of the most important policies is the 1988 Torche Program, which called for high-tech parks and Special Economic Zones (SEZs), institutions on which I will elaborate later. See Chart One in the Chapter Two appendix for specific details on Chinese policies relating to innovation across the past two decades.

*From Global Factory Innovation to Self-Made Innovation?*

Recent policies illustrate China's drive towards innovation. For example, the recent shift in China's economy away from its former 'global factory' model<sup>17</sup>, a model that has allowed China's GDP to grow rapidly by keeping labor and manufacturing costs low. In a sense, the 'global factory economy' was China's own method of 'cost-innovation', where creative methods to keep cost down served as the main pillar. Under this model, China's productivity has soared; but it has also earned China the international reputation of a country that relies on 'imitation' and 'price-cuts' to innovate. Thus China's newest policies reflect the government's desire to move away from 'cost innovation' to a model of scientific innovation more recognizable in the West.

Furthermore, when China entered the WTO in 2001 it came under international scrutiny for its policies surrounding Intellectual Property Rights (IPRs). In the past decade, many foreign governments have challenged the 'imitations' that occur in China. Thanks to pressure from international groups and the enforcement of international IPR standards, since 2001, China has been forced to enact more policies that foster inventions not based on the duplication or reverse-engineering of Western patents (OECD 2007 Synthesis Report: 60).

At China's January 2006 conference of Science and Technology, the Ministry of Science and Technology (MOST) issued a fifteen-year 'National Long and Middle Plan for Science and Technology' commonly referred to as the 2006 Innovation Plan. It focused on stimulating an knowledge-based economy which the government believes is essential to increasing national productivity and global competitiveness. MOST, which falls under government oversight, spent

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<sup>17</sup> See "The End of Cheap China" for more information on the rise of the global factory economy. (<http://www.economist.com/node/21549956>).

three years from 2003 to 2005 developing the 2006 Innovation Plan and included input from over 2000 experts. The Plan's overarching goal is to create an economy of "indigenous innovation", *zizhu chuangxin*, by 2020; in order to achieve this goal it calls for a "national strategy of innovation", unique among national innovation policies. The 2006 Innovation Plan calls for China to "leapfrog" to the front of scientific research, and enhance its S&T and innovation capacities, which will fuel the economic growth objectives the Plan hopes to achieve by 2020. The 2006 Innovation Plan has sections devoted to setting national research goals, offering more intellectual property protection, government procurement and tax benefits for certain goods, and providing increased opportunities for increased R&D expenditures.

The MLP nicely complements the 11<sup>th</sup> five-year plan, which was also announced at the Jan 6<sup>th</sup> 2006 conference. "The 11<sup>th</sup> Five-Year National Plan of Social and Economic Development" also places innovation as a key national strategy for the upcoming years. The policy cites the need to develop internal capabilities to foster innovation and cites certain measures to help commercial businesses achieve this goal. The two plans together set certain goals for the Chinese economy. The goals include:

- Increase per-capita GDP from \$1200 (2006) to \$3000 in 2020
- Increase R&D expenditure each year, with the goals of 2% of total GDP in 2010 and 2.5% or more in 2020

The 11<sup>th</sup> 5-year plan, released by the department of personnel, emphasizes the role of human capital in creating the "innovation-oriented society" called for the 2006 Innovation Plan. The 5-year plan calls for "people oriented S&T", which places people's needs as a prerequisite, nurtures and encourages S&T talents, and increases the public understanding of S&T. In order to do so,

the government announced five shifts in China's S&T plans for the future. The shifts are as follows:

- Development Path: from imitation to innovation
- Innovation Pattern: from individual technology breakthroughs to integrated innovation
- Innovation System: from reform of research institutions to overall development of a national innovation system
- Development Deployment: move from focusing just on R&D to placing equal importance on scientific and technological innovation and science dissemination
- International Exchanges: from exchanges to active collaboration in an all-around way

Source: (Jijun, Xing. Director of Europe for China's Ministry of International Cooperation presentation at Europe Information Society's Energy Efficiency Conference URL:

[http://ec.europa.eu/information\\_society/events/ict4ee/2009/conference/index\\_en.htm](http://ec.europa.eu/information_society/events/ict4ee/2009/conference/index_en.htm))

China's move towards people-oriented S&T marks a new possibility for Returnees. More specifically, step two and three, which represents the heart of the 2006 Innovation Plan, demonstrate national support for innovation and broader investments in indicators of innovation respectively. Moreover, through step five the government hopes to attract international collaboration, development and investments, perhaps hoping to entice overseas Chinese. These plans also affect Returnees.



*Global Reactions to China's MLP*

China's 5-year plan has faced minimal international criticism; however strong international responses to the 2006 Innovation Plan emerged shortly after it was announced. After the 2006 release, two common reactions emerged: skepticism towards China's 2020 goal (US government) and fear of China's new policy (US businesses), where the latter group focused more on the discrimination towards foreign companies they felt was implicit in the plan.<sup>18</sup>

In his testimony for the US House of Representative's Committee on Foreign affairs, Dr. Philip I. Levy on the American Enterprise Institute articulated both these reactions, arguing that although "indigenous innovation policies are unlikely to achieve their objective of vaulting China to the forefront of global innovation [...] contesting this policy should be a principal focus of U.S. commercial diplomacy with China" (Levy 2011: 1). Levy's testimony is not the exception.

Other responses from business leaders echo these concerns. US businesses were upset by the discriminatory policies towards foreign entities in China called for in the plan. The United States International Trade Commission (USITC) cited its concern that based on the policy: "foreign companies will need to share sensitive and proprietary technology with Chinese firms, or government agencies in order to reap the full benefits of their investments in China" (Levy

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<sup>18</sup> The 2006 Innovation Plan policy follows China's first government procurement laws from 2002. It was these laws that first caused controversy among businesses over China's protectionist policies. Article 9 and 10 were particularly discriminatory towards foreign firms. Article 9 calls for certain products to receive 'preferential treatment' including energy-saving products, national indigenous innovation products, products made by small or medium sized enterprises, or products made by undeveloped communities or ethnic minorities. Article 10 requires that domestic goods and services must be purchased over their foreign counterparts, where domestic products are those produced in China and domestic services are limited to projects provided by Chinese citizens, legal persons, or other organization. See Ahrens, "Innovation and the Visible Hand".

2011: 2). The focus on government procurement of indigenous products has led the U.S. Business community to rank China's indigenous innovation policy as its number one policy concern (Ahrens 2010: 1). Strong domestic and international criticism of the 2006 plan has led to subsequent changes.

In January of 2011, heeding Western criticism, presidents Hu Jintao and Barack Obama met to discuss the plan. The meeting led to several changes in the "indigenous innovation" policies.

The following two stipulations emerged:

- 1) The United States and China committed that i) government procurement decisions will not be made based on where the goods' or services' intellectual property is developed or maintained, ii) that there will be no discrimination against innovative products made by foreign suppliers operating in China, and iii) China will delink its innovation policies from its government procurement preferences.
- 2) "China agreed to eliminate discriminatory "indigenous innovation" criteria used to select industrial equipment for an important government catalogue prepared by the Ministry of Industry and Information Technology, to ensure that it will not be used for import substitution, the provision of export subsidies, or to discriminate against American equipment manufacturers in Chinese government programs targeting these products."  
(White House Office of the Press Secretary, "Fact Sheet: US-China Economic Issues", 19 Jan, 2011. URL: <http://www.whitehouse.gov/the-press-office/2011/01/19/fact-sheet-us-china-economic-issues>)

Based on feedback from the international community, China has recently created a revised plan that has eliminated all references to "indigenous innovation". However, how the plan will be enacted still remains elusive.

The strong, negative reactions to the policy have predominately been voiced by US businesses, scholars, and government officials. While discrimination against the US is certainly a valid point of contention, it is ironic that few in the U.S are pointing to the negative impact this policy will have on China's own desire to innovate. Past scholarship on innovation illustrates that protectionism often hinders innovation and retards a society (See: Ahrens 2010, h. z) Despite

ample evidence highlighting this point few American policy analysts have been citing the potential negative consequences for China.

One group that has noticed the potential effects of the policy on China is the US-China Business Council. In a statement issued about the fifteen-year science and technology plan, they wrote:

Improving Intellectual Property Rights (IPR) protection in China is needed not only to curb a problem affecting US companies, but is also in China's own interests to develop its innovative capabilities and to protect the rights and safety of its consumers. China has been making greater efforts to improve its IPR environment, with some successes, but much more must be done (Frisbee, UCBC Website).

Although the US-China Business Council is cognizant of the indirect consequences of this program on China's economy, the argument that the 2006 Innovation Plan will ultimately hurt China is rarely mentioned in the policies and reactions responding to China's initial plan.

A comparison with US policies that encourage the domestic development of science and technology could seem equally as discriminatory. For instance, the Small Business Technology Transfer (SBTT) program is a subset of the Small Business Innovation Research program (SBIR), a larger program created by the U.S. government in 1982 to "foster the innovation necessary to meet the nation's scientific and technological challenges in the 21<sup>st</sup> century" ([http://archive.sba.gov/aboutsba/sbaprograms/sbir/sbirstir/SBIR\\_STTR\\_DESCRIPTION.html](http://archive.sba.gov/aboutsba/sbaprograms/sbir/sbirstir/SBIR_STTR_DESCRIPTION.html)).

Among the criterion, SBTT requires that small businesses be "American-owned and independently operated" and "located in the US" in order to qualify for the program. Throughout the five-year program, small businesses can receive up to 2 million in funding depending on their success. Thus, while China's policies may disadvantage US businesses, it is important to acknowledge that the US has run its own successful version of government procurement for many decades. For example, had it not been for government stimulation and military

procurement for US computer technology in the 1960s, the computer industry might not be as developed as it is today. Thus, while China's efforts to stimulate its own indigenous innovation through exclusionary practices have drawn the attention and anger of other technology-rich nations wanting to be part of China's growth, protectionism in this arena seems understandable and is employed by every high-tech nation.

Ironically, the SBIR programs are globally acknowledged as a model for government stimulus of innovation, despite relying on domestic government procurement (Ahrens 2010: 12). As a result they have avoided gaining a reputation of discrimination. If China's 2006 S&T program were modeled after the SBIR program, it would likely receive less criticism. Nonetheless, the SBIR program shows the potential for China's 2006 S&T program in China.

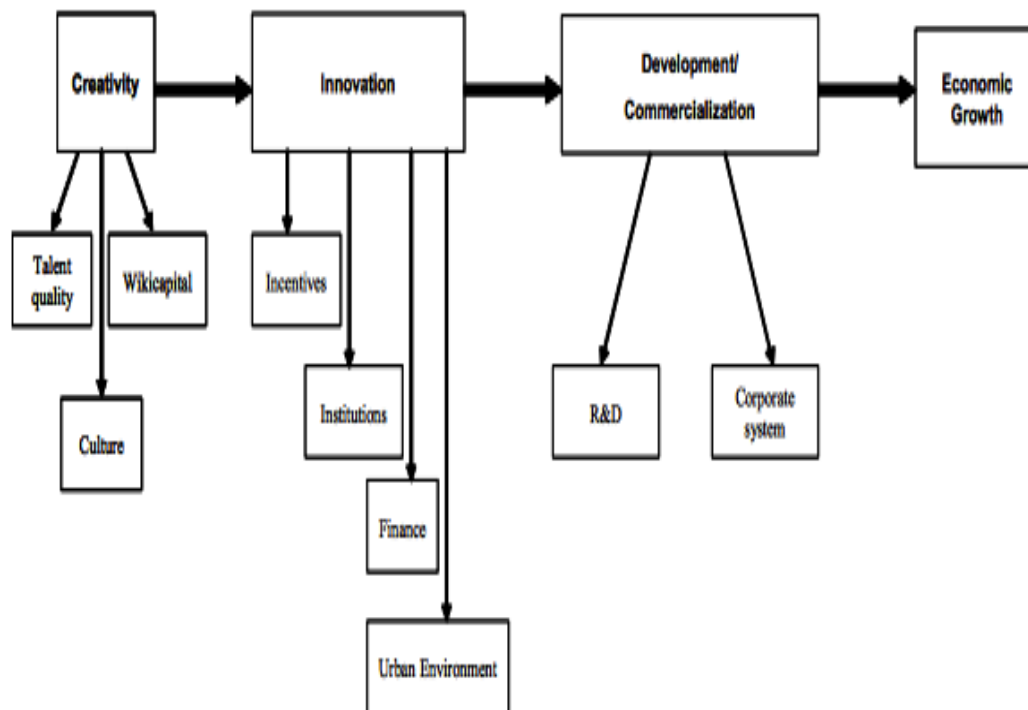
One final reaction (debatable though it may be) to the 2006 Science and Technology Plan is the criticism that China's drive for indigenous innovation is too focused on deliverables, or securing market-based products. Generally speaking, government procurement should be focused on stimulating innovation, a task that often includes funding ventures that do not produce a marketable product. Creating an innovation-friendly procurement policy can be challenging and again the SBIR exemplifies such as policy. SBIR programs give roughly 2.5B in funding each year without expectation of product procurement (<http://www.sbir.gov/about/about-sbir>).

Is the SBIR directly responsible for US small business growth? Many of its funds do help small businesses grow enormously. Nonetheless, although the SBIR indisputably drives beneficial results, the US market also encourages entrepreneurship through its strong patent system and access to venture capital.

## **Innovation in the Chinese Market Place**

A 2008 research study commissioned by the World Bank provides an excellent framework for the stages that connect creativity to the market, and ultimately fuel economic growth (Yusuf 2009: 2). The model divides the entire process into four phases: creativity, innovation, development/commercialization, and economic growth. These phases are again partitioned into categories. For the purposes of this work, I will examine only the components of the innovation phase: incentives, institutions, finance, and an urban environment. Although this study was not country specific, its model provides a great framework for analyzing innovation in China holistically.

The first category, incentives, underscores the need for protection of ideas and the potential for profit from ideas. Although unrelated to the recent debates in China, the report specifically states: “for the incentive systems to deliver sustained results, domestic and foreign competition is needed” (Yusuf 2009: 5). While China’s original 2006 Innovation Plan limited foreign competition, the more recent revisions should adhere to this notion of incentives. Institutions include systems of bankruptcy, patent law and IPR enforcement, as well as government ministries; and in particular the degree to which specific institutions contain practices that are more forgiving of risks. Financing can happen through venture capital, sources of government funding, mergers and acquisitions (M&As), taxes that allow innovators to accrue profit on their venture, and tax credits that encourage investments in innovative activities. Finally, urban areas often facilitate the exchange of a diverse set of ideas, practices and cultures; and cities are often home to advanced learning and education. Below is the flow chart of creativity to economic progress highlight in the Work Bank Report:

**Figure 2. 1: Creativity to Economic Growth Flow Chart**

Source: Yusuf 2009: 2

While this framework does not consider every factor, it provides a model for understanding the societal elements needed to transform a culture of innovation into an economic and market-based tool for growing productivity. Applying the four elements of innovation to the current Chinese state allows us to examine the various elements that exist to support China's 2006 S&T plan. Within each step Returnees play a unique role as part of the overall human capital necessary to drive each element of innovation.

*Incentives: The Birth of Special Economic Zones*

Two years after the end of the Cultural Revolution, the Chinese government embarked on its plan of opening China up to the world. In 1979 they implemented the first steps to this plan by creating Special Economic Zones (SEZs), areas where capitalist market-driven policies existed in order to attract foreign investment and drive China's exports. In 1979 China created four SEZs located in the coastal provinces of Shenzhen, Guangdong and Fujian. The original four zones were oriented around manufacturing and exporting processed goods. Shenzhen, a province in southern China directly across from Hong Kong quickly transformed from a small fishing village to an industrial province. As a result of the SEZ the entire city quickly prospered and soon became the model for China's SEZ policies. In fact in 1999 Shenzhen's SEZ alone exported 81.98 billion Yuan in products (1 billion USD) accounting for 50% of the city's total-wide exports (<http://www.china.org.cn/e-china/openingup/sez.htm>). In 1986 the government added fourteen more cities to the list, notably including Shanghai.

These areas enjoy preferential treatment that includes stipulations such as eliminated or reduced customs tax, discounted prices for use of machinery and resources manufactured in China, the ability to hire foreign personnel (who provide new insights, ideas, and vision), permission to operate enterprises independently and opportunities to lower personal income tax and the company tax rate. Needless to say, Special Economic Zones are a perfect example of government-supported incentives. The preferential treatment provided by the Chinese government continues to allow these zones to be profitable business areas.

Since its opening in 1990 the Shanghai Pudong New Area (Shanghai's SEZ) has attracted considerable amounts in foreign capital. As a result, the State has granted Shanghai Pudong New Area increased preferential treatment. This includes allowing foreigners to establish businesses

and run “tertiary” industries, permitting foreign-funded banks to trade Yuan, and allowing Shanghai to create its own Stock Exchange. For more details on the preferential policies of Pudong’s New Area, see here: (<http://www.china.org.cn/e-china/openingup/sez.htm>). In 2009 the Pudong New Area attracted foreign direct-investment contracts of \$5.529B and foreign direct-investment of \$3.908B. Since then, the New Area Government has outlined the objectives of the SEZ as follows:

By 2011, Pudong will have had total output value of over RMB 500 billion 60% contributed by the tertiary industry, local fiscal revenue with the annual average increase of 10%, per capita disposable income of urban and rural residents up by 10% respectively and comprehensive energy consumption per 10 thousand Yuan output value with the annual average decrease by 4%. By 2020 that marks the 30<sup>th</sup> anniversary of Pudong development and opening up, the total output value of Pudong New Area will have accounted for over one third of the total of Shanghai.

([http://english.pudong.gov.cn/html/pden/pden\\_business\\_bi/20100803/Detail\\_72879.htm](http://english.pudong.gov.cn/html/pden/pden_business_bi/20100803/Detail_72879.htm))

SEZs provide great fiscal, tax, and business incentives for local entrepreneurs looking to bring their business to market.

I had the opportunity to visit one of Shanghai’s flourishing SEZ’s, the *Zhangjiang* Economic Zone. The *Zhangjiang* high-tech park is home to many local Chinese companies as well as multi-national companies such as General Electric. While there I met with a few GE employees, who had studied in the US. Although they were hesitant to talk to me about GE’s particular views on patent filings, research and development, and China’s 2006 policy, they both agreed that China’s high-tech zones provided significant benefits to companies located within the zone.<sup>19</sup> Below shows the different development states of projects in the Zhangjiang High-Tech Park in 2003 and 2004.

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<sup>19</sup> Personal Correspondence with Xin 6 January 2013.



**Table 2. 1: Statistics on R&D of Hi-Tech Enterprises in Zhangjiang Park**

Development Phase	2003	2004	% Growth
Total:	572	741	28.55
Still Performing Research	31	40	29.03
Experimental Development	380	493	29.74
Produced Results	161	208	29.19

Source: [http://www.zjpark.com/zjpark\\_en/nr.aspx?id=29&infoitem\\_id=13](http://www.zjpark.com/zjpark_en/nr.aspx?id=29&infoitem_id=13)

Interestingly, all categories show steady growth between 2003 and 2004. This consistent growth between all three categories represents a constant ability to bring products from the research phase to the deliverables phase.

On my walk around the economic zone I was surprised by the variety of businesses located there. One in particular, the Zhang Jiang Innovation Source, stuck out. I couldn't find their website online; however it seems they are a private business that oversees the government's stipulations for entering the SEZ. Moreover, they track the progress of the park's companies through metrics such as: total foreign investments, total domestic investment, sales, revenue etc. Their name undoubtedly indicates the goal of these zones.

**Figure 2. 2: (Shanghai Pudong's) Zhangjiang (High-Tech Park) Entrepreneurship Source**



Source: Author

Other incentive systems include mechanisms to protect and monetize one's intellectual property. While SEZs certainly accomplish the latter, SEZs themselves have no special effects on IPR regulations or IPR enforcement in China. As evident from the controversies surrounding China's 2006 S&T plan and China's 2001 entrance in the WTO, IPR laws in China have become one of the most controversial topics globally and China has yet to propose a fully appealing and acceptable solution to the problem.

### *Institutions in Modern China*

Moving onto to Yusuf's second component, there are several institutions that contribute to, regulate, and affect how innovation develops in China. Concrete institutions include the Chinese Academy of Sciences (CAS), the Ministry of Science and Technology (MOST) and the SEZs themselves. Intangible institutions most notably include IPR laws, an institution addressed above.

CAS, established in the 1950s under Soviet influence, has played many roles in China's past 60 years of development. It currently functions primarily as a research institution and has goals such as becoming (Suttmeier, Cong & Simon 2006: 80):

- A leading institutions for cutting-edge high-tech R&D
- A facilitator for high-tech entrepreneurship
- A leading global center on basic research
- A sponsor of higher-education and graduate institutions

CAS will be vital to China's scientific progress, and how CAS functions within China's new 2006 Innovation Plan will have a great impact on the Plan's success. In conjunction with China's 2006 Innovation Plan, CAS recently implemented the third phase of its own Knowledge Innovation Program (KIP) which aims to propel CAS to a top-three global research center ranking and create 30 new internationally recognized research academies by 2010, among which 5 are world-leaders (Suttmier, Cong & Simon 2006: 82). Through its own policies, CAS hopes to become the "backbone" of China's new national innovation strategy (Suttmeier, Cong & Simon 2006: 86). The support CAS provides through this program to commercial activities and research institutes is incredibly valuable to China's new "culture of innovation".

The Chinese Ministry of Science and Technology (MOST) is also essential to developing China's scientific capabilities. Included in the ministry's many missions is its creation and implementation of national innovation programs such as the National Basic Research Program, the National High-tech R&D Program and the S&T Enabling Program. Its most notable S&T programs include the 863 Program, National Key Technologies R&D Program, National Basic Research Program of China, and Mega Projects of Science and Research for the 10<sup>th</sup> Five-Year

Plan (see Chapter Two Appendix for more details on these specific plans). The ministry also oversees any programs delegated by the State Council.

To join an SEZ itself is not easy. The Beijing Municipal Science and Technology Commission, the group responsible for regulating the high-tech parks within Beijing's SEZ requires that firms must meet the following criterion to be considered a high-tech enterprise (Liefner & Zeng 2008: 250):

- At least 30% of all employees have at least an undergraduate degree
- Share of R&D investments must be more than 3% of total income
- More than 50% of the total income has to be generated by sales of high/new-technology products

For young firms meeting these criteria can be challenging, hindering the firm's ability to enter the SEZ and its ability to gain funding, through the direct contact with different sources of foreign investment that SEZs provide. While SEZs provide unparalleled resources for companies in China, as an institution to promote innovation they are flawed. Their eligibility requirements promote semi-established firms rather than those with innovative potential, thus supporting the criticism that China's national innovation strategy is focused on deliverables.

### *Financing a New Venture*

Financing is among the most difficult barriers to innovation in China, something I will elaborate upon later. As mentioned above, the majority of R&D projects as well as universities and trainings centers are government dominated. Although the MOE and CAS spend money each year to promote research and education for both academic pursuits and business ventures, they provide little direct stimulus for SEZs.

Often times, the most difficult money for a small business to attain is the seed money that allows it to become “venture ready” (Ahrens 2008: 15). In the West, this money is often acquired through venture capital (VC) or private equity (PE). However not only are both VC and PE options minimal in China, but in many industries such as the biotech industry, the majority of VCs are government-created (Fan 2008: 17) and have harsh regulations that discourage other international VCs from entering the market. As a result, almost all funding must be government sponsored.

A 2008 study on resources for high-tech development in Beijing and Shanghai examined the role of foreign direct investment (FDI) the presence of foreign-invested enterprises (FIE), trade relations with foreign enterprises (FE) and the quantity and quality of local institution and public R&D institutes (RDI). Studies of Chinese high-technology firms shows that firms evolve over time (Walcott 2002: 350-352). According to Susan M Walcott, in the first phase FIE dominates and local firms act relative to FEI; in the second phase firms utilize URI to engage in high-technology production; and finally in the third phase, these two stages merge together and both FIE and URI serve as knowledge-providers for entrepreneurs, high-tech firms, suppliers, and customers.

Funding varies across these stages. Funding from FIE and FE is mainly acquired in the early and late stages of the innovation process, whereas URI is often utilized in the central stages (Liefner & Hennemann 2008, cited in Liefner & Zeng 251). FI provides the majority of capital for SEZs. Below is breakdown of investment received in the Shanghai Pudong Zhanjiang Hi-Tech Park.

**Table 2. 2: Statistics on Foreign Investments for Zhangjiang Hi-Tech Park**

	1993-1999	2000	2001	2002	2003	2004	Total
Companies to Receive Investment	88	140	92	244	245	129	938
Total Investment (USD 10M)	10.3	34.38	17.5	27.83	8.17	3.06	101.24
Foreign Investment (USD 10M)	8.5	31.67	13.8	20.27	4.00	.52	78.76

Source: [http://www.zjpark.com/zjpark\\_en/nr.aspx?id=38&infoitem\\_id=13](http://www.zjpark.com/zjpark_en/nr.aspx?id=38&infoitem_id=13)

In 2003 and 2004 foreign investment represented a small percentage of total investment; however investment overall decreased during those years. This could be a reflection of the success of those enterprises, which required less investment as they matured. Among the foreign investment in the Zhangjiang Hi-Tech Park, the majority is supplied by Australia. Table 2.3 below shows foreign investment granted to the Zhangjiang High-Tech Park in 2004 by country.

**Table 2. 3: Foreign Investment Granted to the Zhangjiang Hi-Tech Park in 2004**

Country	Number of grants	% of total grants	Investment (in USD 10 Million)	% of Total Investment
North America	47	14.42	9.75	4.04
Europe	16	4.9	8.56	3.55
Australia	84	25.77	28.09	11.65
Japan	18	5.52	10.65	4.41
Hong Kong & Taiwan	31	9.51	9.17	3.8
Other	179	54.91	1,94.87	80.76
Total	326	100	2,41.28	100

Source: [http://www.zjpark.com/zjpark\\_en/nr.aspx?id=36&infoitem\\_id=13](http://www.zjpark.com/zjpark_en/nr.aspx?id=36&infoitem_id=13)

Although North America is the second largest provider of grants (excluding the ‘other’ category), its grants provide for less than a twentieth of the total foreign investment in the park.

### *The Urban Environment*

China has done an effective job focusing its innovation policies on urban environments. The SEZs are all located in coastal provinces, many of which are in close proximity to global trading ports. Their fortunate location indirectly enables the exchange of ideas as international visitors enter the country through these cities.

In addition, proximity of different linkages (firms, investment, human capital) is known to be crucial for success in innovation (Salter & Martin 2001: 518). While information can be transferred through publications and online journals, implicit and tacit knowledge is gained through direct interaction with other sources of human capital (Salter & Martin 2001: 518). In this regard, SEZs function as their own urban environment within the larger context of a city by providing the necessary resources for knowledge exchange, interaction and growth.

Surprisingly, proximity and geographic location play another role in China. SEZs located farther from Beijing enjoy greater independence and flexibility in testing new economic policies (Lin 1997: 59, 65) than their counterparts in Beijing. However, more government funding and R&D opportunities exist in Beijing than other areas.

### *Outputs: Patents and Papers*

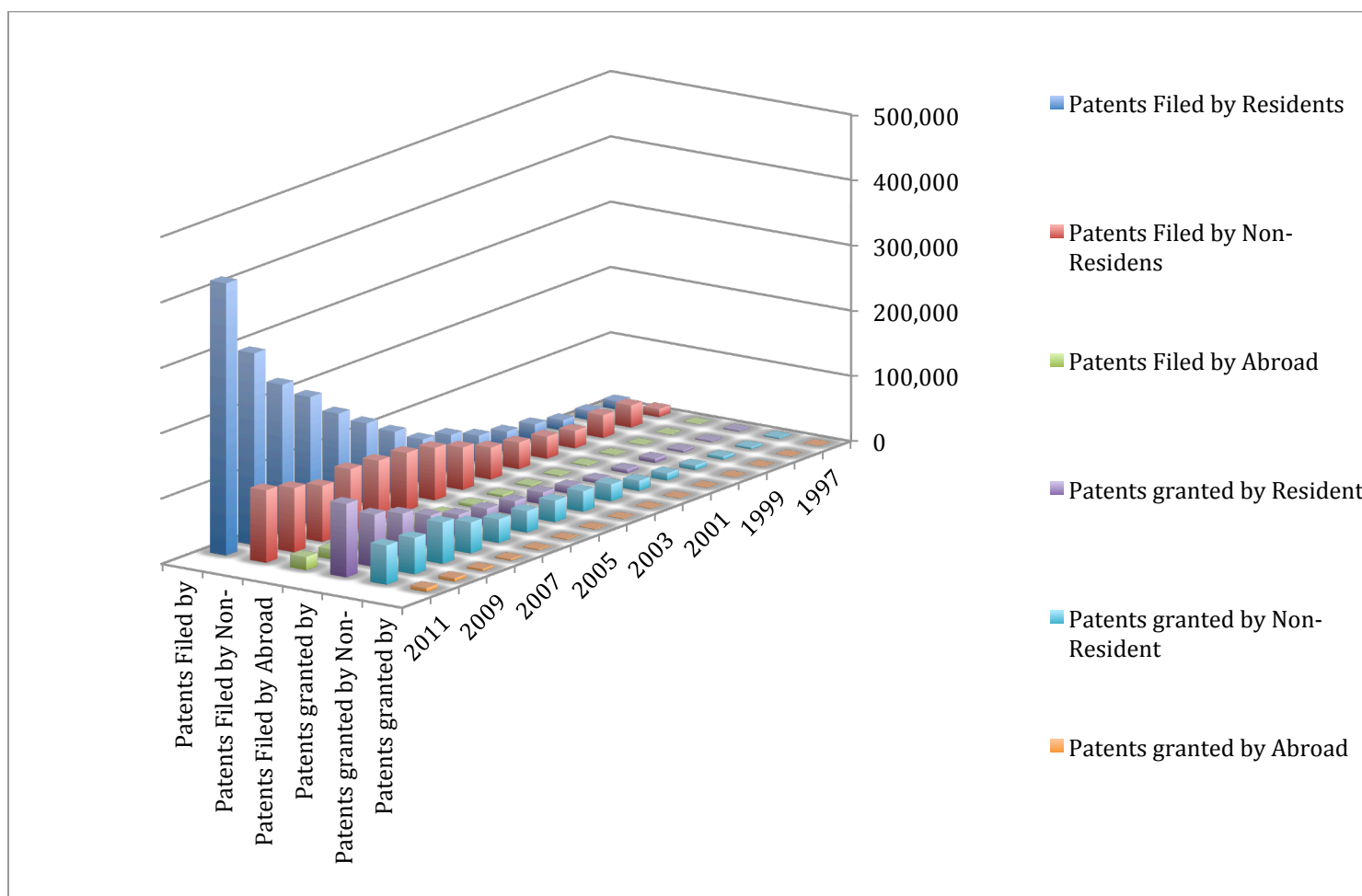
In the past the Chinese government has dealt with its internal innovation problem by sending students abroad. Chinese students have worked with foreign companies, learned science and technology of Western countries, and returned to China to share their knowledge. However, the Chinese government is facing a problem that the majority of its intellectual property is foreign-owned. Although some students return to take up high-level management positions and

start their own labs or companies, Chinese residents are still producing minimal numbers of patents and papers, two common measures of innovation.

In the next section I will measure China's scientific output through an analysis of patent applications and research papers produced. When analyzing patent output in China there are two important variables: applicant nationality and type of patent filing. Applicant nationality is essential to China's question for indigenous innovation. Arguably, the more applications filed by Chinese residents that are granted, the closer China is to achieving its 2020 goals. Patent data from the last fifteen years shows patent applications and grants, segmented by "residents", those who are citizens of China, "non-residents" foreign citizen who file a patent in China, and "abroad", Chinese citizens who file a patent at an international office.



**Figure 2. 3: Total Patents Filed & Granted in China from 1997 - 2011, by Residents, Non-Residents, and Abroad**



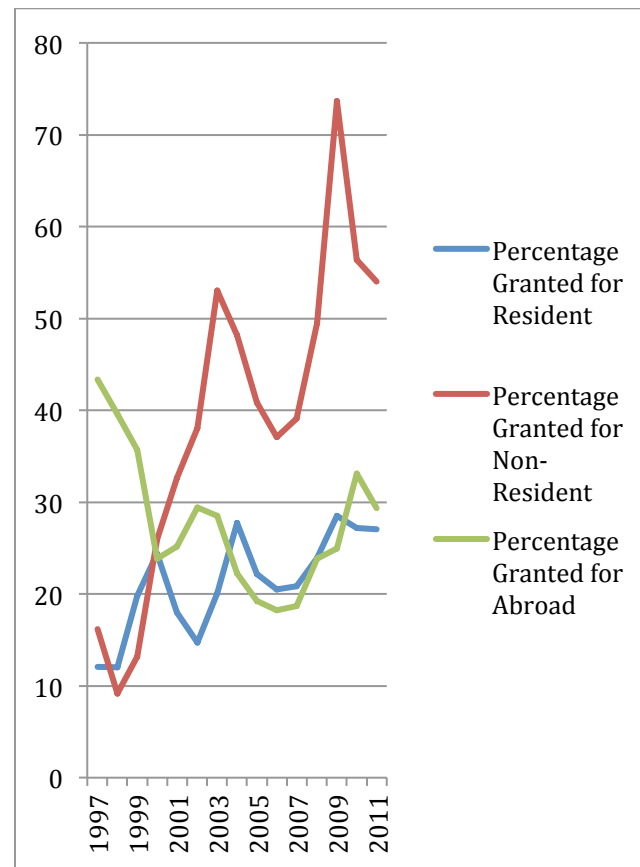
Source: WIPO Statistical Country Profile of China

From the chart a few things become clear. First, patent applications have steadily increased for “residents” and “abroad”, while the patent application rate of non-residents has lingered between 90,000 and 100,000 from 2006-2010. Non-residents finally surpassed 100,000 in 2011. However, although non-residents patent applications have remained fairly sturdy, they continue to show higher rates of success translating applications into patents granted. A further breakdown of the data shows that comparison of applications to grants among the three groups

Year	% Grants for Resident	% Grants for Non-Resident	% Grants for Abroad
1997	12.0	16.2	43.4
1998	12.0	9.2	39.6
1999	19.8	13.2	35.7
2000	24.4	26.0	23.8
2001	18.0	32.6	25.1
2002	14.7	38.1	29.4
2003	20.1	53.0	28.5
2004	27.7	48.2	22.2
2005	22.1	40.8	19.3
2006	20.5	37.1	18.2
2007	20.9	39.1	18.7
2008	24.0	49.5	23.8
2009	28.5	73.7	25.0

**Table 2. 4 (left):  
Percentage of  
Patents Granted as  
Filed by Applicant  
Categories:  
Resident, Non-  
Resident, and  
Abroad**

**Figure 2. 4 (right):  
Percentage of  
Patents Granted as  
Filed by Applicant  
Categories:  
Resident, Non-  
Resident, and  
Abroad**

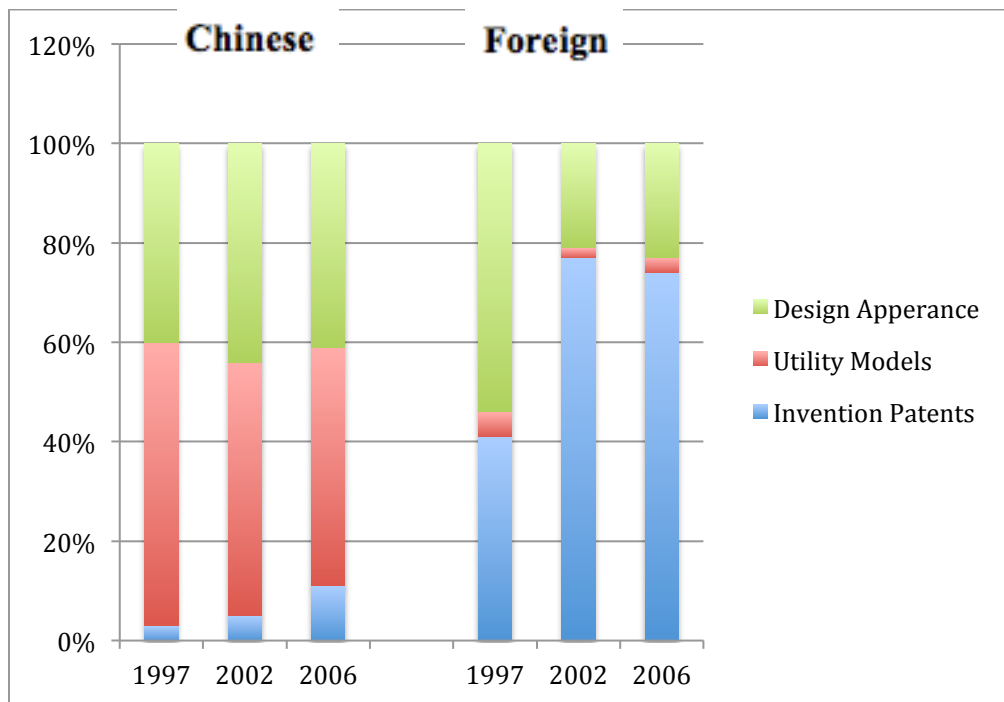


Source: WIPO Country Statistical Profiles China

This table gives a very different picture. Here, one can see that 2000 was the last year that Resident, Non-Resident, and Abroad applicants had a similar rate of success in receiving patent grants. Since then the rate of Non-Resident patent grants has towered significantly over Residents, representing a 250% gap at its peak in 2009.

The second variable worth noting is the type of patent. Applicants must file patents under the categories: “invention”, “utility model” or “design”. An invention patent represents a new “technical solution to a product, a process, or improvement thereof” and it protects the idea globally (Shaowei 2008: 4). Utility models represent a new way of doing something “related to the shape or structure” (Shaowei 2008: 4). Utility models are easier to obtain and do provide protection for a shorter time period than invention patents. However, utility models apply *only* to China. The applicant is bringing a new idea to China. In contrast, design patents represent a new way of using existing products. The applicant is filing for the protection of a new design, however this patent does not cover the subject matter such as processes and chemical compounds. Below is a further breakdown of patents in China, categorized by utility and design.

**Figure 2. 5: Type of Patent Filed by Foreigners and Residents**

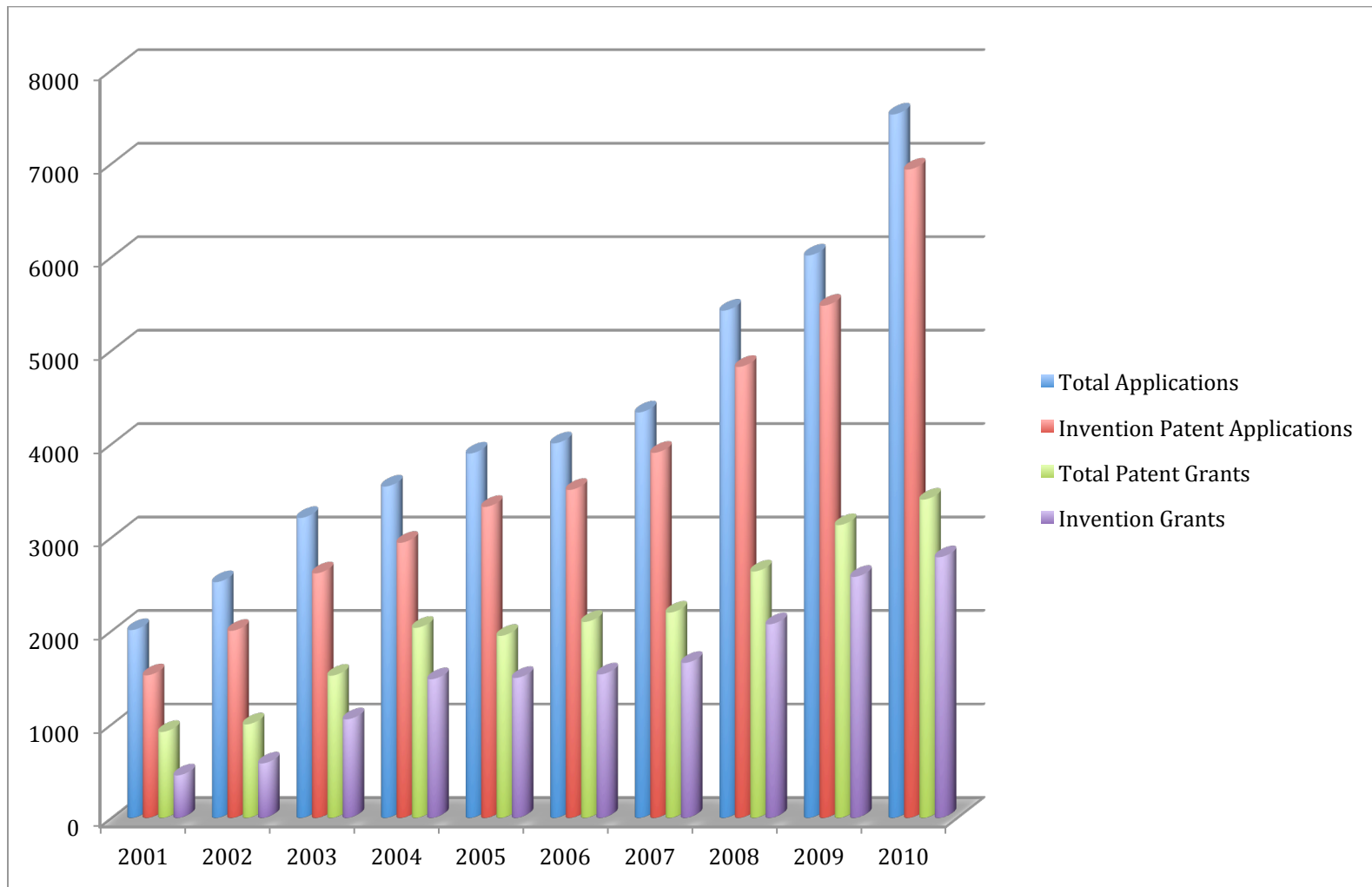


Source: OECD Policy on Innovation in China Report: page 118.

From this graph we see that foreigners own a higher percentage of China's intellectual property. In 2006, foreigners filed roughly seven times as many "invention patents" as their Chinese counterparts. Unfortunately this graph only shows data until 2006; its implications were no doubt firmly in the minds of the policy makers behind China's 2006 Innovation plan.

Although the majority of patents are foreign-owned, the Chinese Academy of Science is starting to reverse the trend in Chinese resident filings. Over the last ten years they have begun to file an increasing number of invention patents. Below is a table of patent application and grants filed by the academy across the past decade.

**Figure 2. 6: Patent Applications & Grants for Invention Patents at Total**



The volume of inventions patent applications has increased similarly to the volume overall patent applications. Notably in 2004 and 2009 when both groups saw a 10% and 5% spike respectively.

However, the rate of grants of invention patents still lags behind China's average rate patent grants. CAS provides a fascinating perspective on the changing patent rates in China. Invention patents comprise the vast majority of applications, however they are granted at a slightly lower rate than the overall rate of applications. Using the data from the graph above is a break down of grants by percentage of total applications:

**Table 2. 5: Patent Grants by Percentage**

	Grants as % of Total Applications	Invention Patents as % Invention Applications	Invention Patents as % of Total Grants
2001	45.8	29.8	49.5
2002	39.7	29.1	58.2
2003	47.4	40.3	69.3
2004	57.4	50.4	73.0
2005	50.0	45.0	76.9
2006	52.3	43.8	73.2
2007	50.6	42.5	75.5
2008	48.6	42.9	78.6
2009	52.1	47.1	82.3
2010	45.3	40.2	81.9

Source: 2011 Chinese Academy of Science Annual Report 2011, Page 13

From the third column, one can deduce the role of CAS in helping China “leapfrog” to the front of global innovation and research. In 2009 and 2010, invention patents granted to CAS represented over 80% of the total grants they received each year. Moreover, CAS itself has been averaging between 40 – 50% success for converting applications to grants in recent years.

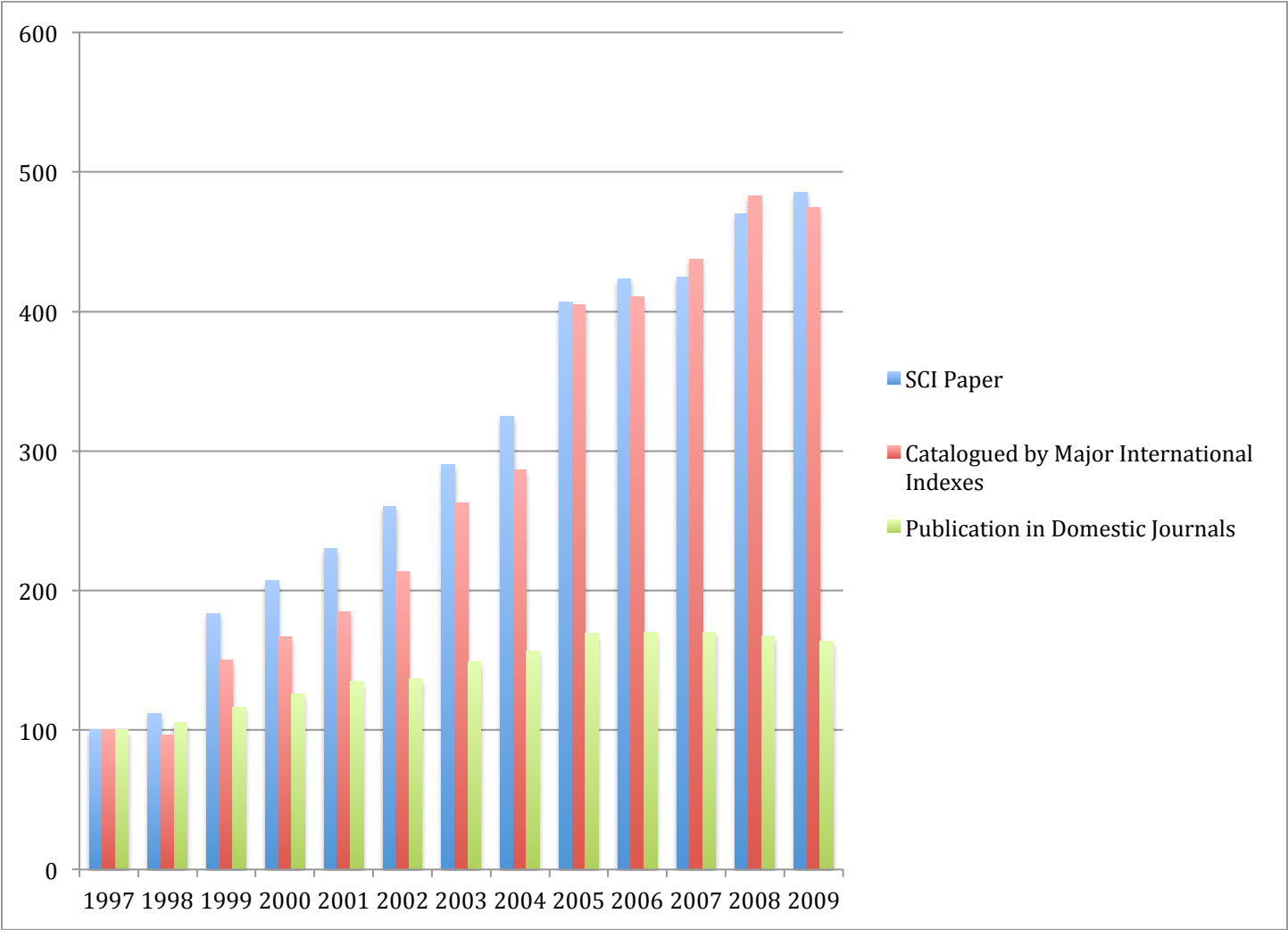
Despite CAS’s success in moving towards a more innovative culture, the numbers that CAS reflects represent a small portion of overall patent filings. In 2010 CAS filed for 7527 of the 391,117 patents, representing fewer than 2% of total patent applications; they received grants for 3406 of the 135,110 granted, comprising 2.5% of total patents granted

### *Research*

China’s research publications have increased dramatically across the past decade. In 2005, Chinese-authored S&T papers published internationally ranked fifth place in the Science Citation Index (SCI) and second place in the Engineering Index (OECD 2008: 130). The increase in domestic publications is also reflected through the Chinese Academy of Science increase in publications.



**Table 2. 6: Publications by the Chinese Academy of Sciences from 1997-2009**



From 2006-2009, publication in domestic journals decreased, meanwhile SCI papers steadily increased. 2008 represents a peak of papers catalogued by major international indexes. This peak may be correlated to the increasing number of students leaving academia to study outside of China, as well as the growing rate of overseas Chinese students.

Although the chart below only reflects papers whose first-author includes a CAS scientist, one can see that SCI papers have increased by over 400% since 2007, meanwhile domestic journal publications have declined. The trends in publication type illustrate CAS's desire to establish Chinese science as a major global force.

**Table 2. 7: National Total of Publications in China from 1998-2009**

	NATIONAL TOTAL					CAS	
Year	Catalogued by Major International Indexes (article)	Publication in Domestic Journal (article)	Catalogued by Major International Indexes (article)	SCI Paper	SCI Cited Internationally (article)	SCI Cited Internationally (# times)	Publication in Domestic Journal (article)
1998	24038	133341	5478	3277	3815	7534	8593
1999	38924	162779	8249	5376	4250	8582	9526
2000	41895	180848	9186	6063	5219	11046	10299
2001	49817	203229	10165	6725	6135	13658	11022
2002	62715	240117	11740	7611	7756	17624	11181
2003	80563	274438	14516	8632	9772	24746	12169
2004	75774	311737	15738	9500	9860	24746	12790
2005	152825	355070	22257	11952	15053	41934	13826
2006	171878	404858	22581	12392	17620	51926	13885
2007	193003	463122	24045	12432	19853	62009	13872
2008	2708878	470020	26569	13761	23282	78600	13673
2009			26104	14202	24995	96405	13395

While the increase in publication demonstrates the growth of homegrown research in China, an analysis of think tanks in China links Returnees directly to this phenomenon. More so than in the US, Chinese think tanks strive to create close government relations and receive significant government funding (Li 2009: 2). Government officials often oversee think tanks (Li 2009: 2). The top five think tanks, ranked by the Chinese government in 2006, are the Chinese Academy of Social Sciences, Development Research Center of the State Council, Chinese Academy of Sciences, Academy of Military Sciences, China Institute of International Study (Li 2009, 6). Both the Chinese Academy of Sciences and the China Institute of International Study devote time, money, and programming to the retention of Returnees.

Returnees' presence in research is evident through many of China's think tanks and government agencies. Perhaps, most striking is the China Center for Economic Research (CCER) at Peking University, China's most prestigious university. The CCER is responsible for advising many of China's key economic decision makers, as well as including some of China's most prominent economist (Li: 16). Below is the breakdown of each member and his education.

**Figure 2. 7: Educational Backgrounds of 2006 China Center for Economic Research**

<i>Name</i>	<i>Professional Title</i>	<i>Field</i>	<i>Graduate School</i>	<i>Degree obtained</i>
Chen Ping	Professor	Physics	University of Texas at Austin	1987
Gong Qiang	Assistant professor	Economics	Northwestern University	2004
Hai Wen	Deputy director & prof.	Economics	University of California at Davis	1991
He Yin	Assistant professor	Economics	University of Colorado at Boulder	2004
Hu Dayuan	Associate professor	Economics	University of Kentucky	1995
Li Ling	Professor	Economics	University of Pittsburgh	1994
Liang Neng	Dean & professor	Economics	Indiana U., U. of Pennsylvania	1990
Lin Yifu (Justin)	Director & professor	Economics	University of Chicago	1986
Lu Feng	Associate professor	Economics	University of Leeds, UK	1994
Ma Hao	Professor	Economics	University of Texas at Austin	1994
Ping Xinqiao	Associate professor	Economics	Cornell University	1998
Shen Minggao	Associate professor	Economics	Stanford University	2001
Song Guoqing	Professor	Economics	University of Chicago	1995
Shi Jianhuai	Associate professor	Economics	Osaka University	1999
Wang Dingding	Associate professor	Economics	University of Hawaii	1990
Wang Hao	Assistant professor	Economics	Ohio State University	2002
Yao Yang	Assoc. prof., dep. dir.	Economics	University of Wisconsin at Madison	1996
Yi Gang	Professor	Economics	University of Illinois	1986
Zeng Yi	Professor	Economics	Brussels Free University	1986
Zhang Fan	Associate professor	Economics	Wayne State University, Michigan	1994
Zhang Lee	Associate professor	Economics	Ohio State University	1999
Zhao Yaohui	Professor	Economics	University of Chicago	1995
Zhao Zhong	Assistant professor	Economics	Johns Hopkins University	2001
Zhou Qiren	Professor	Economics	UC Los Angeles	1995

Source: Cheng Li, "Foreign-Educated Returnees in the PRC: Increasing Political Influence with Limited Official Power." *Journal of International Migration and Integration*, Vol. 7, No. 4 (Fall 2006): 500. For the original data, see <http://www.ccer.edu.cn/en/faculty.asp?BigClassName=EN&SecondClassName=Faculty>, 1 June 2005.

Notes: Assoc. = Associate, Dep. = Deputy, Dir. = Director, Penn. = Pennsylvania, Prof. = Professor, U. = University, UC = University of California.

Source: (Li 2009: 16)

Every single member earned his graduate degree from a Western University, except one who studied in Osaka, Japan. Of the twenty-two Western universities represented, twenty-one are in the US and one is located in the UK. Interestingly, almost everyone had received his degree in the last twenty years. Only four people received international degrees during the 1980s,

among which includes the Brussels Free University in the UK.<sup>20</sup> Returnees continue to penetrate different research and academic pursuits.

### **Lesson from Foreign Owned Invention and Homegrown Research**

China's current market exhibits a unique relationship between *input indicators* (incentives, institutions, financing, urban environment) and *output indicators* (patents, papers). The relationship between the innovation inputs and outputs in China reveals a few trends. First, despite a national innovation system, the Chinese government offers the incentives, institutions, financing, and urban environment in some form, necessary to fuel innovation. Among these four categories there are certainly problems. While the incentives are quite strong and have successfully lured many Returnees back to the nation, the institutions needed to facilitate innovation are weak. Although founding a moneymaking start up is possible within the Chinese market, the legal framework necessary to protect inventions is still missing. Furthermore, there are few outlets for financing new ventures outside of government organizations or established SEZs. Nonetheless, China provides a great urban environment. Thanks to the policies of CAS, the Chinese government has invested substantial money into building world-class universities and research centers, all located in strategic urban areas. Cities such as Shanghai, Beijing and Shenzhen have become incredibly dynamic, international cities that offer a global exchange of ideas.

This analysis of the input factors helps explain the mixed output indicators. Returning to the differentiation between invention and innovation allows one to understand China's situation more clearly. Evidence on patents and publications indicates that increased inventions are happening at an increased rate. However patents alone are not enough to demonstrate an increase

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<sup>20</sup> The range of universities is diverse and impressive. However, my guess is that the top echelon is not represented here. Those students likely earned a position in the US.

in *innovation*, which is a market-based and socially embedded phenomenon. Each innovation relies on a multitude of inventions and a feedback loop from consumer to designer, both of which must happen in a distinct set of cultural settings that help promote the process. These cultural settings do exist through government institutions, financial incentives, and the urban environment China represents. Feedback loops, however, rely predominantly on human capital.

Among China's wealth of human capital, Returnees stand at a unique vantage point. Returnees can provide new models of management, new inventions, and the perspective needed to drive new innovation. What Returnees provide is the mechanism to change China's current system, a process that is a form of innovation on its own. The State's recognition of its own weak innovation system was likely a strong impetus for China's 2006 Innovation Plan. Creating a plan to stimulate 'indigenous innovation' extends beyond the notion of invention. It refers to creating a system of indigenous innovation – where Chinese citizens do not rely on foreigners for the feedback loops and cultural inputs that makes something market-ready.

Has the government successfully stimulated innovation or invention? Despite the growth of domestically owned patents and publications – is the government on track to reaching the 'indigenous innovation' goals that it outlines in its 2006 Innovation Plan? It seems that the incentives are working; research centers exist, and the middle-management leadership talent is growing. However, the market-based commoditization piece is still missing. In part, we can attribute this to the absence of feedback loops, which the government hoped Returnees could provide. In the next chapter I will examine the 'new' Returnee, whose habits and desires differ greatly from the Returnees of the 20<sup>th</sup> century. These new Returnees have different goals and plans than the government might have expected and hoped. Based on data I have collected, I will

re-examine China's human capital problems and particularly the role of Returnees in China's innovation conundrum.



## Appendix to Chapter Two

**Table 2. 8: Key Policies in Science & Technology Administration and Innovation in China and the US since 1982**

Year	Policy	Administrator	Effects
1982	Key Technologies Research and Development Program	Ministry of Science and Technology	Program designed to solve China's key technological issues related to social and economic development, information, transportation, energy resources, environmental protection, health care, etc.
1986	863 Plan: High-tech Research and Development Program	Ministry of Science and Technology	Focus on top quality research of eight areas: biotechnology, aerospace, information, laser, automation, energy resources, materials, and oceanology
1988	Torch Program	CAS	One of China's most important technology reforms. It focused on (i) creating an economy suited for high-tech industry, (ii) creating high-tech zones, (iii) implementing industrial projects based in areas outlined in 863 Plan, (iv) facilitating international cooperation among Chinese high-tech firms, (v) training human capital
1991	Establishment of first high-tech park		
	First group of 27 high-tech parks established		
1995	Decision to accelerate S&T Developments'	State Council	Emphasizes need for S&T research to be

			linked to market
1997	973 Plan: Program for Priority Basic Research and Development	Ministry of Science and Technology	Goals of the program are to 'rejuvenate the country through science and technology' and 'sustainable development'. It created four initiatives: (i) increased scientific research, (ii) deploying relevant research, (iii) nurturing talented human capital in the high-technology field, (iv) setting up national research centers
2001-5	10 <sup>th</sup> 5 Year Plan	Ministry of Personnel	
2006-10	11 <sup>th</sup> 5 Year plan	Ministry of Personnel	
2006-20	15 Year Medium-to Long-Term Plan for the Development of Science and Technology	President Hu Jintao	
2011	2011 US Spending Bill	Representative Frank Wolf & the US House of Representatives Appropriations Committee	Cuts funding for scientific exchange between China and NASA or White House Office of Science and Technology Policy for fiscal year of 2011

Source: Compiled by author. Information from: Fan 2008, Cong

## **Chapter Three: Changing Trends in Human Capital: the New ‘Returnee’**

### **The Role of Human Capital in Innovation**

According to Nethaniel Ahren’s work on the role of government procurement in China, seven different factors foster indigenous innovation (Ahrens 2008: 7):

1. Availability of scientists and engineers,
2. Investment in and incentives for R&D,
3. Quality of universities and research institutions,
4. Protection of intellectual property rights,
5. University-industry collaboration,
6. Competition and openness linkages,
7. Government procurement of advanced R&D products.

The last chapter addressed the ways in which the Chinese government is stimulating many of these elements. However, factors one, five, and six are not only linked to policy; they are also strongly dependent on human capital. The “availability of scientists and engineers” requires both training and desire on behalf of China’s citizens to obtain this knowledge and apply it in the Chinese market. Students, researchers, and business leaders interested in incorporating research into the market lead “university-industry collaboration”. Finally, “Competition and openness linkages” requires competition from outside sources and openness to new ideas, both of which Returnees directly provide. Linkages may be the most important aspect of what human capital can provide.

The importance of linkages in stimulating innovation is highlighted in international innovation policy. The UK’s National Endowment for Science, Technology, and the Arts states

that innovation relies on exchange with external ideas. They have created an innovation model called AC/DC, which stands for “absorptive capacity” and “development capacity” (Mahroum et al. 2008: 14). Their philosophy rests on the idea that one must absorb external knowledge in order to create new innovation. In a similar vein, the Australian government recently published a report arguing that: “Australia produces 3 per cent of the world’s formal research. Our capacity to innovate depends very much on how effectively we harness and apply the other 97%” (Australian Government 2009: 26). Moreover, in a study on patent filings by US-based IBM Company, of the 1087 patents received in 1993 only 21% cited in-house research. (Narin et al. (2007) cited by Ahrens 2008: 8). Although IBM’s volume of patent-filings has increased, the importance of adopting and learning from outside research has not changed. Innovation starts with linkages and interactions with outsiders, what Returnees have historically offered.

Human capital is essential to innovation. Throughout history, Returnees have been key to China’s growth. Originally going abroad was seen as way of ‘serving the country’, as Returnees would learn new skills while abroad and return with a wealth of outside knowledge that would help China to progress forward. Official Chinese policy focused on the ability of Returnees to “strengthen the nation through science and technology”; however, Returnees also provided linkages to the outside world. Ironically, even before the government’s recent focus on the role of Returnees in innovation, Returnees existed as a mechanism for stimulating innovation.

However across the past decade the profile of Returnees has changed. In fact, more Chinese citizens are going abroad *and* remaining abroad. Those who are currently abroad and have yet to repatriate are commonly referred to as ‘Overseas Chinese’. These students no longer return to China to stimulate the innovation the government intends.

## Overseas Chinese & Non-Returnees

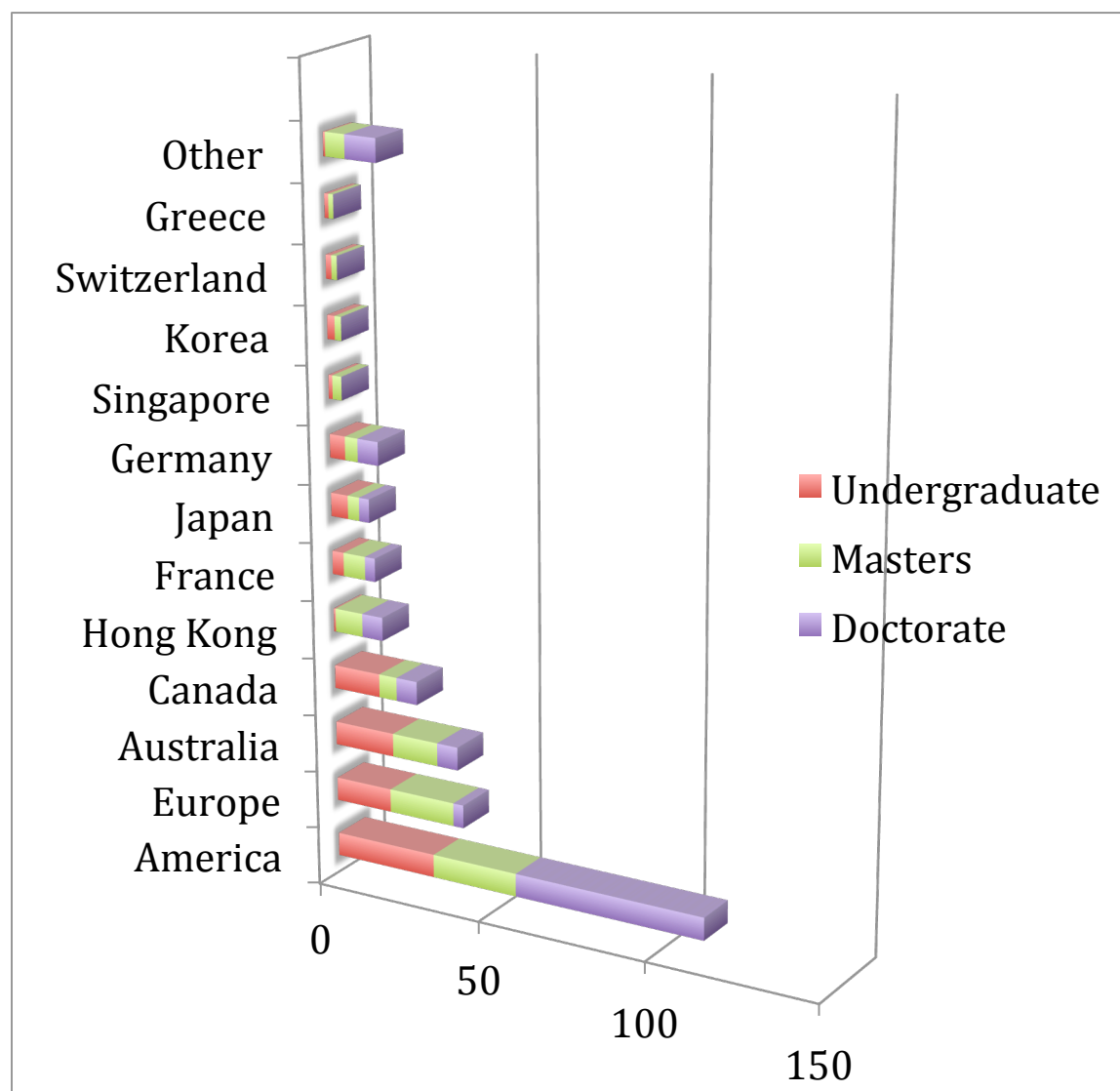
### *Profile of the Modern Returnee*

While my research focuses on Chinese students who visit the United States, the term ‘Returnee’ applies to any person who leaves the mainland to study and eventually returns to China. Traditionally scholars visited countries close in proximity to China. Around the turn of the twentieth century, almost 22,000 Chinese students studied abroad in Japan (Zweig, D.; Fung, C. S.; Han, D., 2008, 1). However, over time Returnees have shifted away from studying in Asia in favor of Europe and the Americas. Within the Western countries, Chinese students have predominantly studied in the US.

Not surprisingly, country destinations reflect China’s internal policies. For example, Chinese student protests against the Government in 1988-87 led Deng Xiaoping to criticize the large number of students flocking to the United States to study. The document that emerged argued for cutting the number of students studying in the US from 68% to 20% total (Zweig 2006: 67). Likewise, until 1997 only 1000 students visited Canada each year; however after the Canadian Education Centre Network opened its first office in Beijing in 1998, the number of Chinese students rose sharply. Roughly 10,000 Chinese students go to Canada annually today, (Zweig, D.; Fung, C. S.; Han, D., 2008, 6). Immigration policy also plays an important role in study destinations. Canadian immigration laws allow mainland students to count years in school towards their citizenship, in contrast to Japanese immigration laws, which make it challenging for Returnees to maintain citizenship.

The United States continues to be the most popular destination, followed by the UK. The chart below shows the breakdown of Chinese scholars intending to get their undergraduate, masters, and doctorates degree in and the top twelve destinations of study.

**Figure 3. 1: 2012 Top International Destinations for Undergraduate, Masters, and PhD Study**



Source: <http://www.ubroad.cn/archives/87674/4>

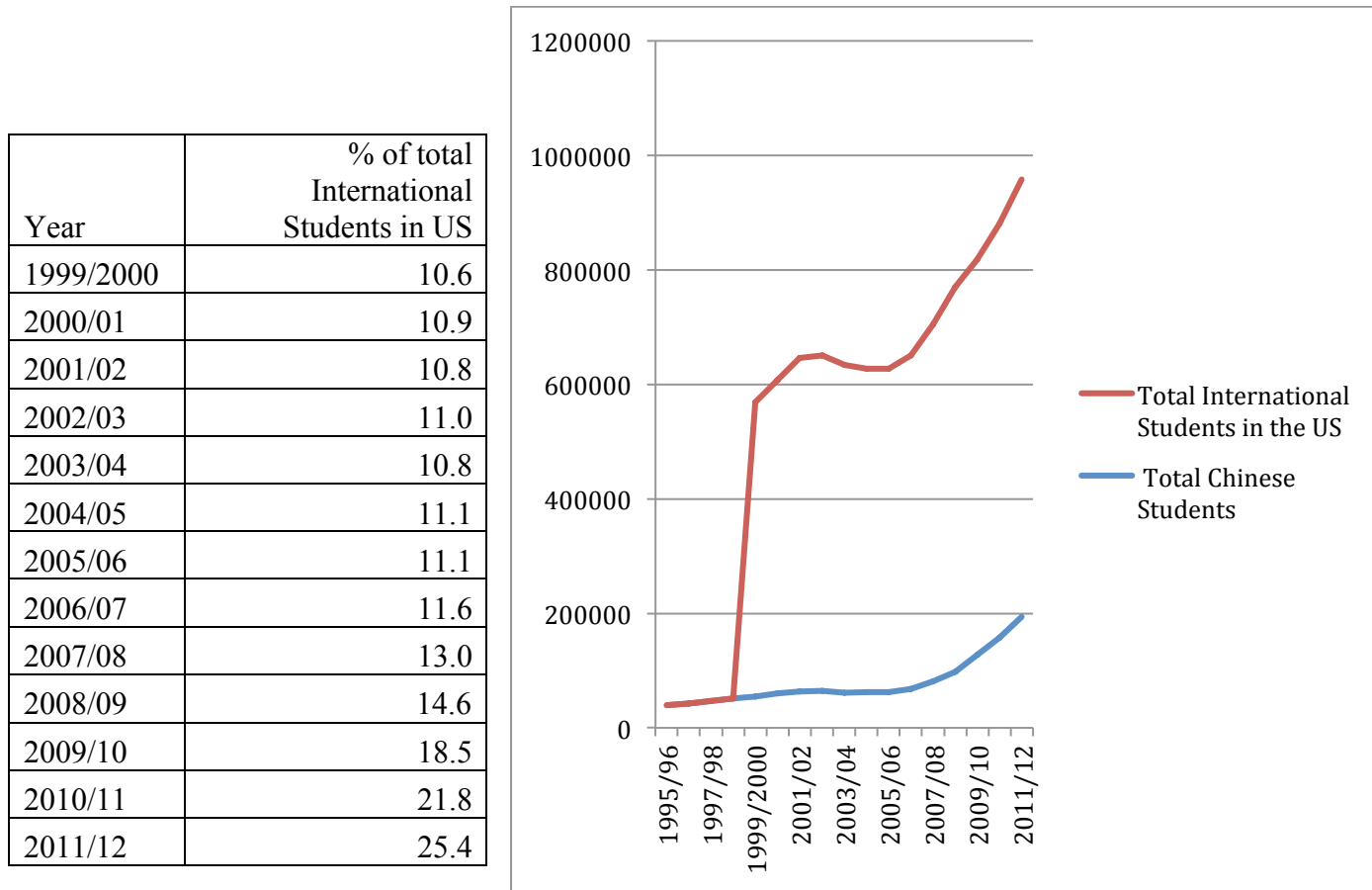
The US ranks highest in all three degree categories. For undergraduate programs, Australia is second to the US, whereas England follows the US in masters programs. Over fifty percent of Chinese students receiving their PhD abroad chose to study in the United States.

The destination of study impacts the attitudes and beliefs of Returnees. A study by Donglin Han and Richard Zweig on Chinese scholars in Japan and Canada reveals that mainland Chinese students in Canada are more supportive of free trade and are more liberal than their counterparts in Japan (Han & Zweig 2008:15). While this conclusion is not surprising, mainland students in Canada are also *more* ‘hawkish’ than their counterparts studying in Japan – in their study, more than 55 percent of Overseas Chinese in Canada agree that military force can be necessary in foreign policy, compared to 43 percent of mainland scholars in Japan (Zweig, D.; Fung, C. S.; Han, D., 2008: 16). Thus, one cannot predict the impact of study destination on overall beliefs and attitudes.

### *American Policies Towards Chinese Immigration*

As Chinese students increasingly choose to study in the US, they have slowly overtaken India as the largest nationality of foreign students in the US. Chinese students now represent over a quarter of the foreign students in the US. Below is a graph showing the increase of Chinese students to the US. Figure 5 in the Appendix gives statistics on the number of Chinese students who leave the country, go to America, and return, by year.

**Figure 3. 2: Chinese Students in the US as % of Total International Students in US**



Sources: Open Door Center, Fact sheets on International Students Leading Place of Origin Fact Sheets & 2012 Fact Sheet: China



1-94 cards and visa applications provide another lens through which to understand the increase in Chinese students immigrating to the US. Chinese citizens receiving 1-94 cards, granted to non-immigrants, have more than tripled across the last decades. In 2010, Chinese citizens received approximately 1.038 million 1-94 cards; in 2011 China reached 1.364 million cards, surpassing India. China now represents the third largest Asian population awarded U.S. 1-94 cards after Japan and Korea. Figure 1 in the appendix shows the increase in 1-94 visas awarded to Chinese nationals and Asians across the last fifteen years.

In addition to the increase in 1-94 visas, the US has also awarded an increasing number of F1 and J1 visas, visas awarded for students planning to matriculate from a US institution to exchange visitors, scholars, and academics respectively. Between 1988 and 1992, the number of Chinese citizens who earned science and engineering PhD's at US universities increased 400%. Moreover, the total rate of PhD's awarded has continued to rise until 1996, when it hit 3000 PhD's annually (Open Doors Center).

**Figure 3. 3: Differences between different Immigration Documents**

<u>1-94 Card</u>	<u>F1 Visa</u>	<u>J1 Visa</u>
<ul style="list-style-type: none"><li>➤ Shows that non-immigrant has legally entered the US</li><li>➤ Gives permission to enter and remain in US indefinitely, or until type of visa expires</li></ul>	<ul style="list-style-type: none"><li>➤ Non-immigrant student visa issued to full time students</li><li>➤ Must be able to demonstrate financial support for entire duration of study independent of employment opportunities in US</li></ul>	<ul style="list-style-type: none"><li>➤ Non-immigrant visa for those wishing pursue cultural or work exchanges within the US</li></ul>

Data from the Chinese Service Center for Scholarly Exchange (CSCSE) on degrees received by Chinese citizens from foreign countries between 1991-2005 shows that the US was issued second-highest number of doctoral degrees to Chinese students, followed by Japan. It was not among the top three countries for masters or undergraduate degrees authenticated. Japan appeared in all three degree-categories.

**Table 3. 1: Overseas Degrees Authenticated by CSCSE, 1991-2005**

Degree	% of Total	1	2	3
PhD (4027)	9	Japan (1584)	US (590)	Germany (390)
MA (31,965)	72	UK (9979)	Japan (2893)	Australia (2802)
Undergrads (7158)	19	Russia (469)	Japan (436)	UK (415)

Source: <http://journals.cambridge.org.proxy.lib.duke.edu/action/displayFulltext?type=1&fid=7808226&jid=CQY&volumeId=202&issueId=-1&aid=7808224&bodyId=&membershipNumber=&societyETOCSession=>

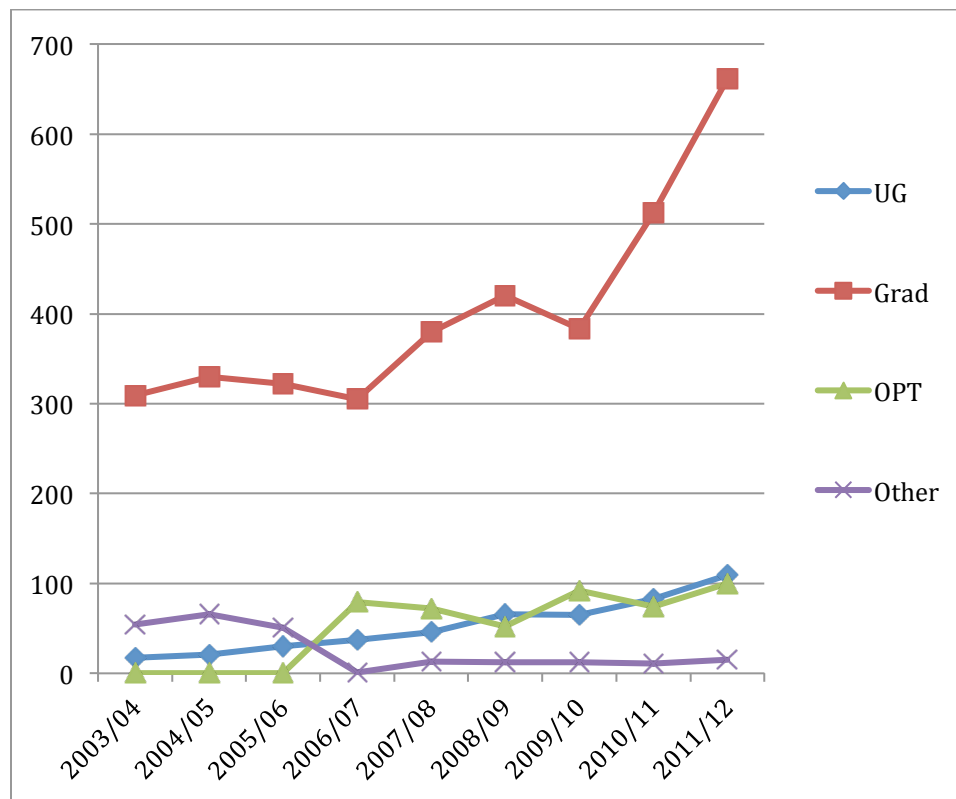
Throughout the least decade these trends have shifted. More students now favor studying in the West particularly in the US. Similarly, Japan's economic and environmental catastrophes have likely discouraged students from studying there.

These trends are corroborated by the international enrollment of Chinese students here at Duke. First, data from the Duke office of visa services indicates that 2620 of the 2788 international students enrolled in Duke during the 2011-2012 academic year are here on an F1 visas (Duke Office of Visa Services)<sup>1</sup>; in other words the majority of these students are hoping to earn a degree and graduate from Duke University. Moreover, that same year there were 885 Chinese students enrolled at Duke (Duke Office of Visa Services), representing over 30% of the international students. The table below shows the number of Chinese international exchange students at Duke by program, across the last 10 years.

**Table 3. 2: Chinese Student Enrollment at Duke University**

Year	UG	Grad	OPT	Other
2003/04	17	309	n/a	54
2004/05	21	330	n/a	66
2005/06	30	322	n/a	51
2006/07	37	305	79	1
2007/08	46	380	72	13
2008/09	66	420	52	12
2009/10	65	383	92	12
2010/11	83	512	74	11
2011/12	109	661	100	15

Because of differences in data recording methods, the office of Visa services made no distinction between OPT and ‘other’ in 2003, 2004 and 2005. In the early 2000’s graduate students out-numbered undergraduates by almost 18 to 1; the ratio has narrowed, however graduate students are still favored roughly 6 to 1. Reasons for this include the lower tuition required for graduate programs (as many provide fellowships and stipends) as well as the reverence placed of PhD scholars in China.

**Figure 3. 4: Duke International Students from China by Year, by Program**

Source: Data from Duke Office of Visa Services.

As exchange rates have increased and the number of scholars has grown enormously, so has collaboration between Chinese and US academic institutions. In a very famous example, a Berkeley professor of geography created a joint research center with China's Nanjing University (Chen and Liu 2003: 175-176 (cited by Zweig et al., 16: 2008), beginning the precedent of collaborative research.

Mainland scholars studying and living in North America also nurture the relationship between the US and China. In a study of 756 academics at sixty universities randomly selected among the top three hundred universities in the United States (with a 12.5% response rate), and 428 academics at 23 universities randomly selected from the top 300 universities in Canada (with a 14% response rate), 78% of mainland respondents have had at least one interaction with

Chinese scholars back home (Zweig, D.; Fung, C. S; Han, D., 2008: 23). Below is the table showing the most common types of interactions.

**Table 3. 3: Patterns of Interaction with China, by Overseas Mainland Academics in the US and Canada**

Modes of Interaction	US (%)	Canada (%)
Collaborative Research Projects	44	38
Running Seminars or Mini-courses in China	39	49
Training Mainland Students Overseas	30	32
Giving Academic Papers in the Mainland	17	19
Editing a Book with a Mainland Scholar	14	8
Consulting with Companies in the Mainland	5	8
Visiting Family	79	71

Source: <http://sts.sagepub.com.proxy.lib.duke.edu/content/13/1/1.full.pdf+html>

The dominant reason for collaboration is “promoting the quality of research in China” (Zweig, D.; Fung, C. S; Han, D., 2008: 23). Despite many sea turtle’s lack of desire to return to China, they are still committed to China’s internal academic improvement.

Although academic exchange between the China and the US and Canada is increasing, according to the chart only 5% of mainland scholars in the US are working with a Chinese company back home. Thus it seems that earning a PhD from a US institution does not directly encourage university-industry collaboration.

#### *The Rising Middle Class: A New Economic Phenomenon in China*

China’s increase of students studying abroad is expensive for the individual family and for the State. An increasing number of Chinese parents invest their life savings in their child’s foreign education, in contrast to the original scholars whose tuition and study abroad fees were covered by government institutions. An American diploma is believed to be a ticket to upward mobility. The Institute of International Education (<http://www.iie.org/>) reports that in 2011,

723,000 international students studied at US colleges, among which 157,558 were from China. Chinese students comprise fewer than 20% of all international students studying at US colleges.

A 2004 report on the sources of funding for 1500 publically sponsored Chinese students and scholars shows that 62.3% were government sponsored; however the government only provided 30% of the total funding for these scholars (Zweig, Changgui & Rosen 2004: 744). Less than 60% of the total funding allotted to these scholars came from overseas agencies (Zweig, Changgui & Rosen 2004: 744). Around the turn of the 21<sup>st</sup> century funding predominantly came from overseas organizations.

Today outside funding is far less common. Of the sixteen people who responded to my survey question about sources of funding, twelve replied that their families funded their experience, two responded that the government funded them, and two indicated that US organizations supplied funding, among which Duke was one. The US does not offer financial aid to any international students. US Website [www.eduPASS.org](http://www.eduPASS.org), which provides information for foreign students on the entire college process from admissions, to financing, to cultural acclimatizing specifically states: “Please note that the US government student assistance programs, including the Pell Grant, Stafford and PLUS loans, and work-study programs, are *not* available to international students” (<http://www.edupass.org/finaid/sources.phtml>).

However, despite this warning Edupass still praises the advantages of studying in the US. The Edupass website writes:

You will find that a US higher education adds considerable value to your professional development. A US education can enhance your career and prepare you for leadership in your country. It can broaden your horizons and expose you to a variety of perspectives, the latest technology, and state-of-the-art research and training. A degree from a US college or university is a stamp of excellence that marks you for life. (<http://www.edupass.org/admissions/advantages.phtml>)

Companies and universities alike recognize the financial burdens of studying in the US.

Nonetheless, they continue to propagate the message that a US education will outweigh the costs through future employment and leadership advantages.

Meanwhile, US private schools and colleges are more eager than ever to accept Chinese students: their enrollment guarantees a student paying full tuition. However, competition to get into school is so steep that, according to a 2012 New York Times blog, “half of all Chinese students will have faked something in their admission packet” (McDonald 2012: 1). At Massachusetts prestigious Deerfield Academy, Dean of Admission and Financial Aid Patricia Gimble reports that fraudulence has increased as the number of applications from Chinese students has increased (Gao 2012, *The Atlantic*).

Many universities recognize it is their best interest to actively recruit and retain more international students; American universities have been specifically targeting China’s new middle class. At the University of Michigan a student from China will be charged the typical \$38,000 in tuition and fees, while a student from Africa could pay less than \$13,000 (McDonald 2012: 2). Likewise, the University of Iowa earns substantial revenue from Chinese students. 1,245 of its 1,734 international students are from China (McMurtrie 2012: 3). And the University of Iowa is not alone. A recent report published by the University of North Carolina at Chapel Hill focused on furthering collaboration between the UNC’s and China cites the “additional tuition revenue” (Dogwood and the Dragon 2012: 32) that international students provide as an impetus for collaboration; the study also reports that international students across the state of North Carolina spent \$304 million in 2011, among which international students on UNC’s campuses alone spent \$159 million (Dogwood and the Dragon 2012: 32).

On a nation-wide level, international students continue to enrich the country.

([http://www.nafsa.org/Explore\\_International\\_Education/Impact/Data\\_And\\_Statistics/International\\_Education\\_Data\\_\\_Statistics/](http://www.nafsa.org/Explore_International_Education/Impact/Data_And_Statistics/International_Education_Data__Statistics/)). Head of international education at University of Colorado explains the trend is “pretty much revenue-driven” because “the domestic market is just not as large as the international market” (McMurtie 2012: 4). A recent report in the Chronicle of Higher Education supports this perspective in its profile of recent trends during 2011.

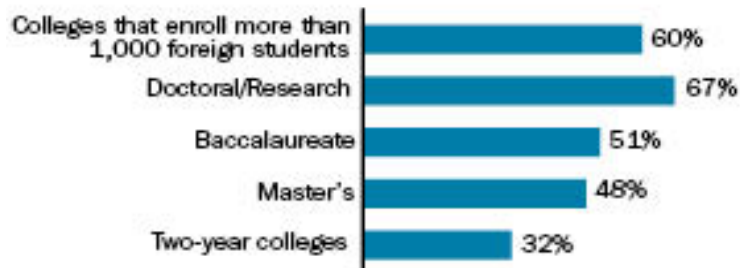


**Figure 3. 5: US Media Outlook on Overseas Chinese in US**

## Foreign Students in the United States: a Snapshot of Fall 2011

In October, 746 institutions were surveyed online about their international-student enrollments and their recruitment strategies. Here are some of the results.

### Colleges reporting an increase in new international enrollments, by type:



### Colleges reporting changes in new international enrollment by selected countries and regions

Country/region	Increase	Decrease
Brazil	26%	13%
China	58%	12%
Europe	34%	16%
India	26%	26%
Japan	24%	22%

### Steps colleges are taking to make sure foreign-student enrollments don't decline

Hiring new staff or allocating additional staff time	54%
Starting new international programs or collaborations	53%
Providing more money for marketing and promotion	37%
Providing more money and recruiting trips	32%

Note: Total percentages do not always add up to 100 because respondents could list more than one answer to certain questions. Not all survey results are shown. The figures have been rounded.

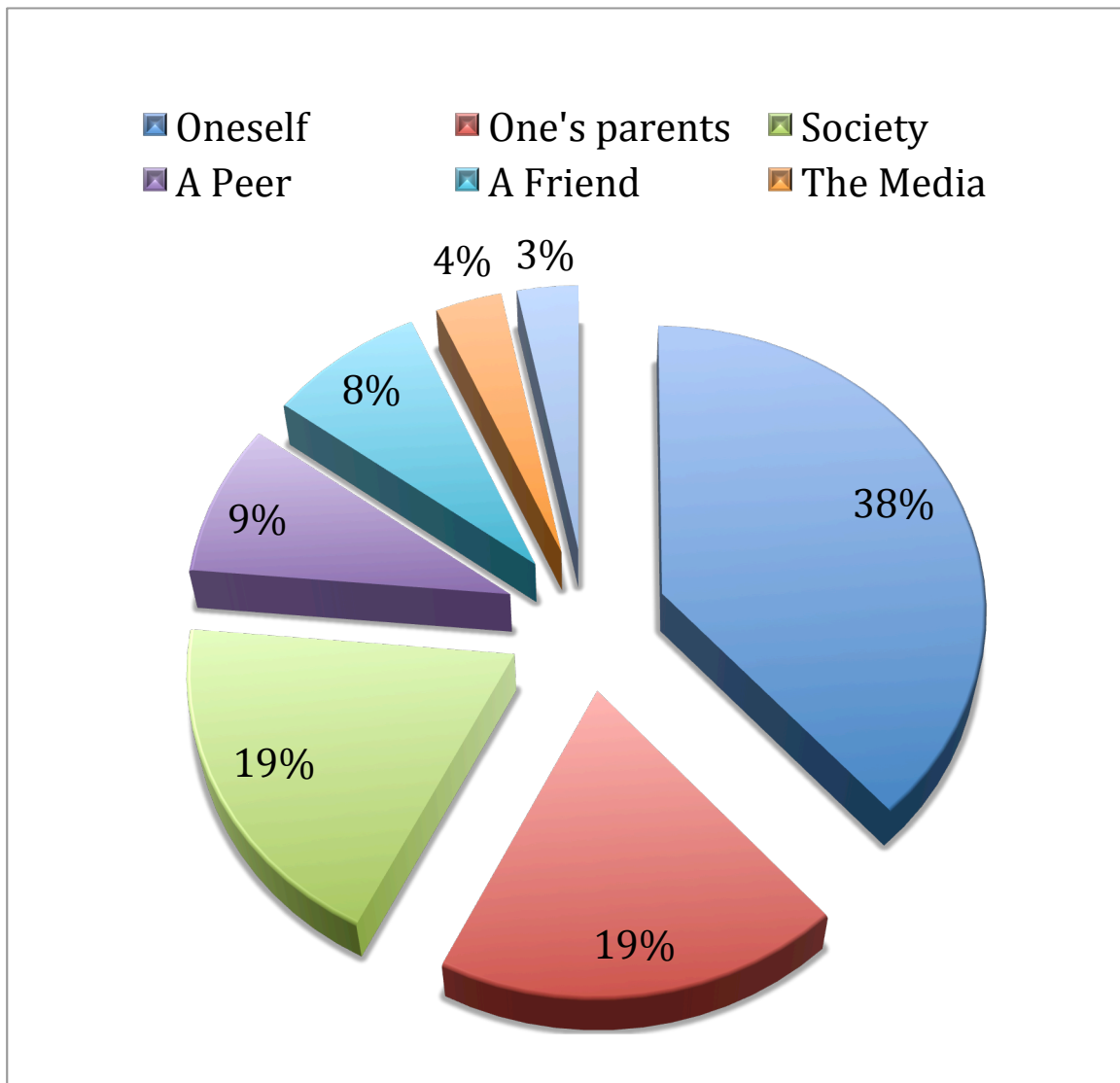
Sources: Institute of International Education in Cooperation with American Association of Community Colleges, American Association of State Colleges and Universities, American Council on Education, Association of American Universities, Association of Public and Land-Grant Universities, Council of Graduate Schools, and NAFSA: Association of International Educators

Source: <http://chronicle.com/article/International-Enrollments/129747/>

The increase in Chinese students depicted in the Chronicle survey, is particularly interesting in contrast to low rate of Indian students. China, which in 2011, surpassed India for number of student and exchange US visas awarded, seems more eager for its citizens to have a US education than its Asian counterpart. Second, the focus on foreign student recruitment illustrates the importance colleges place on these students. Colleges are willing to spend significant revenue on advertising and foreign infrastructure to entice and retain international students.

The increasing number of families that are sending their students abroad has created a trend where going abroad is now ‘cool.’ In a survey administered by a Chinese college preparatory website about the factors (e.g., oneself, one’s parents, society) that influence the decision of Chinese students to study abroad, many students who cited their parents or society as a factor, also stated that they didn’t have a good understanding of the foreign education systems (Uabroad.com, page 2). Many of these students were following the fashionable and popular trend now very visible among China’s middle class. In Table 3.6 below one can see the factors that influence a student’s decision to study abroad.

**Figure 3. 6: Greatest Influencing Factors in Choosing to Study Abroad**



Source: Data compiled from: <http://www.ubroad.cn/archives/87674/2>

Notably, equally as many students reported the influence of society as parents. In the past, many Chinese parents were the impetus for studying abroad as they believed a degree from a US university would guarantee future success for the family. Now, several things are likely occurring. Chinese parents may realize the economic burden and future uncertainty it places on children and society's trend towards emigrating abroad may be stronger than ever. Both of these

have strengthened the phenomenon of Chinese students leaving China, many of who return unhappily years later.

Furthermore, the perception that studying in the US will strengthen one's career opportunities exists among many Chinese families. US universities promote this idea, however they rarely highlight the need for foreign students to gain skills outside of the classroom. Gaining employment abroad can be crucial to one's success after repatriating. For example, Returnees who have worked in the US for 3-5 years make 300 thousand RMB more on average than those who return immediately. (<http://www.ubroad.cn/archives/87674/4>).

Moreover, the focus on a foreign education does not always include an understanding of the cultural, emotional, and academic challenges that studying abroad entails. A Chinese blog on American culture published a post for Chinese students preparing to study abroad. The article writes about five difficulties all students face: language, culture, loneliness, competition, and work barriers (<http://www.meiguoliyu.com/html/chuguoliuxue/news/233.html>). The last concern, work barriers, is particularly fascinating. The article says:

The fifth difficulty is work. It is incredibly important to find an internship in the country, because when you graduate you will have accumulated some work experience. It is better if your experience is abroad, so this can be really challenging. For this, many students will take a job washing dishes, however I think finding a standard internship is better.  
(Blogger: 责任编辑, Translated from Chinese)

Although Chinese students and society realize the importance of securing work as early as one's freshman year, in practice it can be very difficult. For example, my Chinese peer, Yue Pei, a graduate of Fuqua's Management and Engineering Masters (MEM) program, explains the challenge to me: "The majority of my peers here can find some work that pays. However to get an American company to sponsor you is very difficult" Yue rightly recognizes the greatest

challenge for many students is not due to cultural or academic struggles, but from US visa regulations and processes.

In fact securing a work visa in the US is one of the most challenging aspects for every international student. Despite claims of a University of Delaware study pointing out that hiring an international student is not as challenging as employers may think, most US companies will not sponsor international students. Companies are deterred by the time and expense of processing visa and works permits; and also prefer domestic students for their cultural and language understanding. According to a memo published by the University's career services center, minimal paperwork and fees are actually required for hiring students on F1 or J1 visas (<http://www.udel.edu/CSC/pdfs/Hiring-Int-Students.pdf>). According to the memo, "a company may save money by hiring international students because the majority of them are exempt from Social Security (FICA) and Medicare tax requirements" (<http://www.udel.edu/CSC/pdfs/Hiring-Int-Students.pdf>). Nonetheless, this is rare in practice. Due to financial constraints, hiring capacity, and firm size, among other factors, most firms sponsor few international students.

At the beginning of the 21st century similar policies in England outraged many Returnees as well as Chinese government officials. Despite the high rate of students obtaining undergraduate and masters degrees from British universities, the government created legislation "forbidding" Returnees from working upon graduation (Han & Zweig 2008: 4). Chinese government officials were so angry over the policy that in 2007 the Chinese Minister of Education Zhou Ji along with the British Secretary for State for Innovations Universities and Skills negotiated an agreement that Overseas Chinese who graduated from a British University would have 18 months to stay, assuming they could find employment (China Daily 2007: 1). The agreement did not directly address the issue of sponsorship.

In addition to encouraging Chinese students to travel overseas and earn degrees from foreign universities, the government hopes Overseas Chinese will take an entry-level position with a Western company. By doing so, Overseas Chinese learn valuable management and leadership skills. They also reap the benefits of the strong employee development invested by most Western firms. Overseas Chinese with work experience and strong management skills, are highly coveted by the Chinese government to fill middle-management roles in China. As I explain below, Returnees with this level of experience are often rewarded with salary and title promotions if they return to China (Zhang 2007).

### *The Lonely Returnee*

Despite the financial burden involved, Chinese students continue to flock to American universities. The number of Chinese students graduating from American universities has increased meanwhile the number of Chinese college graduates matriculating from Chinese Universities has skyrocketed. What happens to these Chinese students when they return to China?

There are several different types of Returnees. A 2007 article by Zhang Ming'ai categorizes Returnees as successful, enterprising, or jobless (Zhang 2007: 1). He describes successful Returnees as students who:

Graduate from top universities at home to build a solid foundation for their future development; they further their education in world famous universities abroad and acquire a masters degree or higher; their research fields are new economy, high-tech, and third industry; and, they all have high-level management experience at multinational corporations or foreign-funded enterprises (Zhang 2007: 1).

Data on the salaries of Returnees corroborates the relationship between Returnees who possess high-level management experience and who have higher salaries, however little data exists on the link between successful careers and the geographic location of a student's undergraduate and

graduate work. Zhang uses enterprising returnees to refer to younger Returnees. He cites a 2006 study by the Innovation and Development Forum 2006 for Returned Chinese Students, which reports that these Returnees on average left the country at 26 and returned at 32. Enterprising Returnees spent 5 years studying and 3.1 years working abroad (Zhang 2007:1). The jobless Returnees are often the youngest group, who possess little work experience.

Successful Returnees often find jobs in middle and high-level management positions. Many MNC's have Returnees leading their companies or as vice-presidents. See Figure 4 in the appendix for a list of Returnees located in senior management in MNCs across China.

Returnees who repatriate immediately after graduating suffer from a minimal English-speaking ability, few marketable skills, high salary expectations and trouble re-integrating (China Daily 2004: 2). A Chinese report on the 2012 trends of Chinese students studying abroad writes: "Although most students make the independent choice to study abroad, they don't fully understand the situation. They do it because it's a trend".<sup>1</sup> Chinese students often fail to recognize the economic ramifications of studying in the West. Successful entrepreneur and Returnee, Liu Haoyuan, who started a business offering ATM protection services throughout China explains "It is good to study abroad, but the crux of the matter is whether or not you can perform competently and become a valuable asset to the business" (China Daily 2004:2). Although Liu started his company while attending an American university and MBA program, he still recognizes that a US education does not guarantee success.

Moreover the number of students graduating from top-Chinese universities has altered the job market. These students have lower salary expectations. Li Qingyuan, Director-General of the Research Center of the China Securities Regulatory Commission (CSRC), argues: "The gap between the 'Returnees' (overseas trained doctors) and 'homegrown scholars' (domestically

educated doctors) has been greatly narrowed. Therefore, it is not necessary to separate Returnees from their homegrown counterparts." (Zhang 2007: 1). The increase of 'homegrown scholars' is changing China's job market.

In particular, the high salary expectations of repatriate Returnees are causing economic and social turmoil. Similar to the US, many families will pool money, take out loans, and even sell their apartments in order to fund their child's college experience. However, the American degree does not guarantee them a US-job or even a higher-paying job in China. These unemployed Returnees pose a problem both for their own future but also to the future of their family. Traditionally, the working members of the family have supported the entire family. Since the majority of today's Returnees are only-children due to the Family Planning Reforms<sup>1</sup> implemented in 1979, they are often expected to support their entire family, or three generations (themselves, their parents and their grandparents) when they enter the work arena. Table 3 in the appendix shows traditional Chinese cultural values. Filial piety still ranks first, followed by industry, defined as working hard. These top two values illustrate the burden Returnees feel to support their family via hard work. Returnees who cannot find a job often bring significant economic hardship on to their families.

The Chinese media has recognized this phenomenon using a play on the word "sea-turtle". Chinese papers have renamed the unemployed Returnees 'seaweed', a pun derived from the Chinese phrase sea turtle waiting for a job, *haigui daiye*, which shortened becomes *haidai* 海带, or sea weed. The "seaweed" consumes society's resources.

### **The Repatriation Decision: Opinions from Raleigh-Durham**

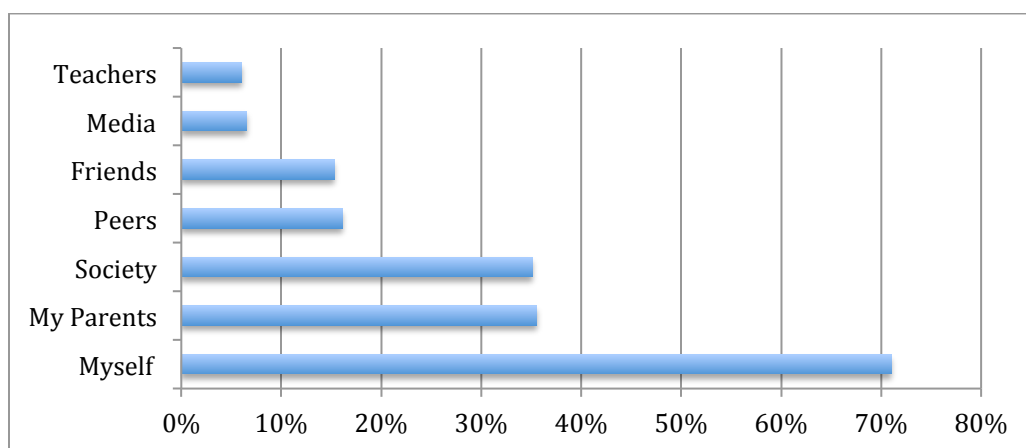
In order to assess the beliefs of overseas Chinese, I collected data from Chinese students, scholars, and community members here in the Raleigh-Durham area. I created a survey to assess



the repatriation decision most Chinese students face. I based my survey on a similar survey developed by David Zweig, for his article: “To Return or Not to Return? Politics vs. Economics in China’s Brain Drain” (Zweig 1997). Zweig’s 1993 study is based on 273 interviews with students, scholars and former Chinese citizens that resided in the United States at the time. While Zweig was interested in the incentives for returning, my survey asks similar question to Zweig’s 1997 survey in order to assess how the incentives have changed.

I asked undergraduates, graduates, and recent graduates to distribute my survey to friends as they saw fit. Overall I received 26 responses, however only 16 were completed in entirety. While my survey data is not large enough to draw substantial conclusions, it sheds light on the human capital the government hopes will fuel its new innovation policies. Moreover, since this topic is incredibly current, the most recent data about the role of human capital in China comes from my surveys, conversations with first-hand sources, and newspaper article.

In order to understand the repatriation question, I first asked participants about their reasoning for studying in the US. The question asked if they independently chose to study in the US or if their family members encouraged them to study in the US. Respondents were allowed to choose both options. Thirteen respondents indicated it was their choice and five said it was their family’s decision, with two people choosing both answers. A 2012 Chinese study abroad archives surveyed 22,305 findings (people could chose multiple options in their study.)

**Figure 3. 7: Factors Influencing One's Decision to Study Abroad**

Source: <http://www.ubroad.cn/archives/87674/2>

While many Chinese citizens students may not fully understand the effect of studying in the US, it seems that they are primarily responsible for the decision. Students do not rely on the media, society, friends, or teachers as much as they rely on themselves.

Following this question, I asked them to reflect on their studies in America. 64% of participants replied that they were confident in their decision to study in the US while 29% indicated that they were happy about their decision but unsure of their future. Only one person had a negative response; he selected the option “I am unhappy I studied in America because I’m not sure it was the right decision”.

From these first two questions it is evident that the majority of my survey participants had individually chosen to study in the US and they were very happy with their decision. Since I did not collect data on why students chose to study in the US, I can only venture a guess at their reasoning. Personal conversations and newspaper articles about the subject suggest two likely reasons. First, Chinese parents perceive an economic and social mobility to studying in the US. In contrast, students are more likely to be attracted to the glamour of studying in a foreign

country and the social prominence that it brings. Studying in the US is undoubtedly a mark of a new modern and likely wealthy upper-middle class citizen.

Throughout their period of study abroad, Chinese students face an overarching question: how, when, and why do they return to China? In a personal correspondence with Dr. Cong Cao, a top China scholar, he reported that roughly the top 20% of overseas Chinese successfully find a job in America, while the other 80% move elsewhere, continue their studies, or most likely return to China (personal correspondence with Dr. Cao). Thus, I asked participants four questions about repatriation. The questions were: “Why would someone return to China?” “Why would someone not return to China?” “Why would someone stay in America?” “Why would someone not stay in America?” Each of these questions offered ten or more answer choices, which aligned with Zweig’s answer choices. I asked participants to select three, while Zweig asked his participants to rank the top three.

The top answers to the first question in order of frequency selected were family ties in China, familiarity with Chinese culture, better work opportunities, and higher societal status in China. Zweig’s 1993 study had similar responses but with a different focus. In his study higher social status in China was the most frequent answer, followed by better career opportunities, higher social status and family ties.

The reasoning behind *not* returning to China has changed across the past two decades. Participants in my survey ranked ‘bad working environment’ most frequently, followed by an equal selection of ‘little potential for job development’ and ‘lack of political freedom’. Although my sample size is significantly smaller than Zweig’s samples size, this represents the first major discrepancy in our data. Over 30% of Zweig’s respondents selected ‘lack of political stability’ as a reason for not returning. The second and third most common answers hovered around 12%;

they were ‘lack of political freedom’ and ‘lack of opportunity for career advancement’. The low selection of ‘lack of political stability’ directly correlates to the political events of the last two decades. Zweig’s study took place in 1993, in the wake of Tian’anmen Square Massacres and the student protests. In contrast, although China’s political society is still tumultuous the government has created more transparent rules and more regularly enforces rules surrounding the market place.

Top reasons why a person may remain in America were ‘for a better future’ followed by an even distribution between ‘it provides a good working environment’ and ‘good living standards’. In contrast, in Zweig’s study ‘political freedom’ was selected by just under 40% of the participants; with ‘lots of job choices or opportunity’ and ‘good working conditions’ coming in next respectively. Again, due to the changing environment in China, lack of political freedom in China appears less important than economic potentials in America.

Finally, the most common reasons chosen for why one may leave America were ‘racism,’ ‘missing friends and family,’ ‘crime and personal safety’ and ‘visa problems’; the latter two were tied for third. In Zweig’s study the top response was ‘the pressure and speed of life is too fast,’ followed by ‘crime and personal insecurity,’ followed by ‘job insecurity.’ Ironically, despite intense globalization, Chinese citizens no longer find the pressure and speed of life of the US to be an obstacle. This is likely because during this time period China has globalized at an even faster rate than the US. The younger generation has become accustomed to the bustling cities and a fast pace of life. The emergence of racism as the main deterrent for staying in the US also poses interesting questions. The respondents may have encountered individual racism, or they may interpret the stricter visa laws and lack of sponsorship opportunities as form of political and business discrimination.

## Supplanting the Brain Drain: China's Brain Circulation

### *The Returnee Entrepreneur*

Despite the rise of overseas Chinese who remain in the West, many Chinese either choose or are forced to repatriate. Many of these Returnees have secured top leadership positions, management roles, academic positions, or more recently, become entrepreneurs. This later trend does not just exist among Returnees, rather many “Chinese intellectuals have been reoriented towards the business world” (Wang et. al, 2011: 15)

Current findings by Zweig, Fung and Vanhonacker on 100 Returnees and 100 local entrepreneurs in Shanghai, Beijing and Guangzhou provide an interesting profile of the prototypical Returnee entrepreneur. Surprisingly, “years spent abroad” by the entrepreneurs varies dramatically. The results from the study are summed up here (Zweig et al, 2006):

- 82 percent of Returnee entrepreneurs are male
- 82 percent are between the ages of 31 and 50,
- 39 percent are children of academics or teachers, followed by 21 percent from senior officials and 17 percent from general officials (all upper class backgrounds)
- 80 percent are *not* affiliated with the Party
- 47 percent received an undergraduate degree in China before moving abroad
- 42 percent received their masters abroad
- 81 percent gained practical work experience before returning
- 50 percent claimed they learned scientific research while abroad, followed by 21 percent citing skills in sales, marketing and project management.

Although China's first entrepreneurs were scientists and academics, since the 1990's many of China's entrepreneurs are also Returnees (Zweig & Lin 2012: 415). There are several reasons why Returnees may account for many of China's entrepreneurs. Liu et al. posit that

“Returnee entrepreneurs may have specific, idiosyncratic human capital that relates to a spectrum of skills and knowledge with varying degrees of transferability” (Liu 2008: 1186, citing Castanias & Helfat 1992) or that Returnees have “specific social capital that involves the relational and structural resources attained through a network of social relationships abroad” (Liu et al 2010: 1186, citing Cooper & Yin, 2005). Yet even more important is the theory of linkages between firms. Inter-firm employee mobility is a key factor in knowledge transfers. In fact, the high rates of employee mobility among Silicon Valley computer firms led to much of the knowledge transfer and innovation that occurred across the early 90’s. (Liu et al. 2010: 1186, citing Saxenian 1994). The advanced technological knowledge that Returnees gain from abroad is narrowing the technological gap between China and the OECD countries (Liu et al. 2010: 1193). Firms without Returnees have also benefited from the new knowledge and innovation present in the market. In fact, it is argued that non-Returnee firms should build linkages with high Returnee firms in order to develop innovative capability (Liu et al 2010: 1194).

Securing venture capital funding is certainly easier for Returnee entrepreneur than for their local counterparts, not only due to international linkages, but also because of their penetration into this market. In fact, Returnees manage the majority international venture capital companies (Wang et al. 2011: 418). The government has recognized the importance of VCs and has enabled them to thrive within China. Most VCs emerged in the late 1990s and early 2000s; by 2006, analysts estimate that VCs in China had invested almost US\$2 billion in new firms (Wang et al. 2011: 419). Perhaps because of the linkages, Returnees are more likely to receive funding than local Chinese. Data from the Zhongguancun High Tech Park, shows that 80% of overseas capital was allocated for Returnee enterprises (Wang et al., 2011: 425). This is likely attributed to the linkages Returnees have with foreign institutions, familiarity with global

business culture, and educational background. Zhu Min, Chair of the Cybernaut (China) Venture Capital Management Company attributes the high success rate for acquiring funding to their ability to build teams (Contemporary Chinese Returnees, cited by Wang et al, 2011: 426). A foreign education undoubtedly exposes Returnees to different backgrounds, beliefs, and cultures, which in turn might help them assemble a more diverse team. And diversity of thinking generally leads to increased innovation and stronger results.

Successful Returnee entrepreneurs include Zhu Min, the founder of WebEx. Min founded his first company, Future Lab, in Silicon Valley in 1991; and six years later founded WebEx, a software company that *Forbes Magazine* named one of the world's top 25 high-tech companies in 2003 (Wang et. al 2011: 417). Successful Returnee entrepreneurs have started companies such as well-known travel websites, Ctrip and Home Inns, both of which have been listed on NASDAQ (Wang et. al 2011: 417).

Many of these Returnees face challenges when they bring their ideas to the global market. CEO, Dong Zhonghan, of Vimicro Corp, the first chip company listed on the NASDAQ, was challenged about the proprietary intellectual property rights used in the company's chip design. (Zheng 2007: 14-15). This example is just one of several that speaks to the international issues surrounding entrepreneurship in China. While China's market is large, entrepreneurs who are looking to capture the global market face obstacles in credibility, product quality, and an overall attitude of distrust towards Chinese innovation. Many in the West still view China as a land of imitation. Deng applied for over 1000 international and domestic patents to secure the proprietary IPR needed for his company (Wang et al, 2011: 418). Nonetheless, Vimicro's largest costs in its first few years of operation came from persuading investors that Chinese firms could produce and protect their intellectual property rights (Wang et al, 2011: 418).

### *Case Study of Zhang Xin*

I want to conclude this chapter on the importance of Returnees for stimulating innovation and economic growth in China by including a vignette of perhaps the most illustrious and successful Returnee, Zhang Xin. Xin is a real estate mogul and the 5<sup>th</sup> self-made woman billionaire in the world. Xin studied at Cambridge University and worked at Goldman Sachs in London before returning to China. Xin was born during the Cultural Revolution and spent many years in the countryside during her youth. At age 14 she moved to Hong Kong in search of work. After saving enough money, she moved to London where she received the education and training that would ultimately propel her into China's elite business world. She returned to China in the early 1990's as foreign investment began flowing into China. In an effort to liberalize China through increased business, she teamed up with Pan Shiyi, her future husband and business partner ([http://www.cbsnews.com/8301-18560\\_162-57572175/zhang-xin-chinas-real-estate-mogul](http://www.cbsnews.com/8301-18560_162-57572175/zhang-xin-chinas-real-estate-mogul)). Together they founded SOHO China, a real estate company that builds commercial and office buildings in Shanghai and Beijing. Xin relies on her Wall Street connections to raise money from foreign investors and to recruit top architects. Her company now has \$10 Billion in assets. While Xin has been extraordinarily successful, her story illustrates how foreign training and connections can benefit Returnees.

Xin strongly believes in China's potential. She recognizes that corruption still plagues many of China's businesses, however she is confident that open market tools like public actions and transparent accounting will reduce corruption and cronyism ([http://www.cbsnews.com/8301-18560\\_162-57572175/zhang-xin-chinas-real-estate-mogul](http://www.cbsnews.com/8301-18560_162-57572175/zhang-xin-chinas-real-estate-mogul)). Furthermore, Xin believes that many Chinese are craving democracy and that democracy will come to the country within the next twenty years ([http://www.cbsnews.com/8301-18560\\_162-57572175/zhang-xin-chinas-real-estate-mogul](http://www.cbsnews.com/8301-18560_162-57572175/zhang-xin-chinas-real-estate-mogul)).



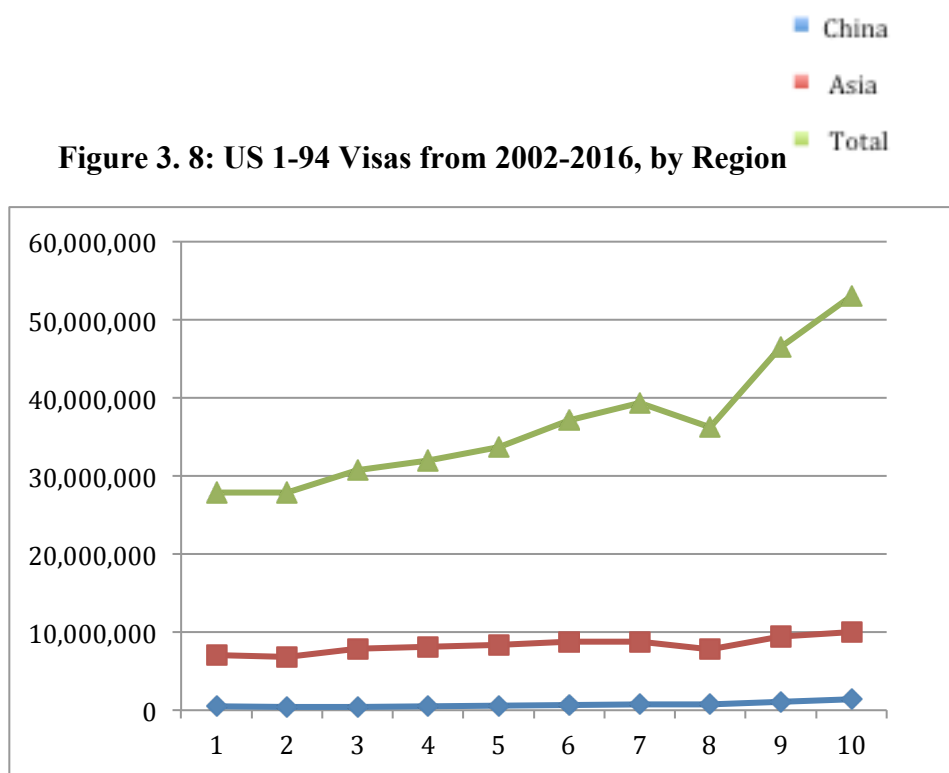
[estate-mogul/](#)). In her 60 Minutes interview Xin reminds the viewers: “China is the place that [has] produced more self-made billionaires than any other country”

([http://www.cbsnews.com/8301-18560\\_162-57572175/zhang-xin-chinas-real-estate-mogul/](http://www.cbsnews.com/8301-18560_162-57572175/zhang-xin-chinas-real-estate-mogul/)).

Xin is only one, among many Returnees, local citizens, and government officials, who recognize the potential growth China offers for those who can leverage China’s rapid globalization and growing new markets.

## Appendix to Chapter Three

**Figure 3. 8: US 1-94 Visas from 2002-2016, by Region**



Source: Data from Yearbook of Immigration Statistics

**Figure 3. 9: I-94 Visas Awarded in 2011 by Country and Region**



Source: Data from Yearbook of Immigration Statistics, 2011

**Figure 3.10: Returnees in top MNC Management Positions.**

1. Ya-Qin Zhang, President, Microsoft China
2. David Li Yi, Chairman and country head, UBS, China
3. Kai-Fu Lee, President, Google China
4. Jack Gao, Vice President, News Corporation and CEO of Start China
5. Raymond Wang, Vice President, Siemens, China
6. Jack Shu, Vice President, Hewlett Packard China
7. Yi Min, Vice President, BP China
8. Erfei Liu, Chairman, Merrill Lynch China

Source: Compiled by author, includes information from Wang et al 2011

**Table 3. 4: Statistics on Students who Leave China, Come to the US, and Return to China, by Year, From 1995-2012**

Year	Leave China	Come to US	Return (overall)	Rate
2012	180,000			n/a
2011		194029		n/a
2010		157558		n/a
2009		127628		n/a
2008	179800	98235	69300	0.385428254
2007	144000	81127	44000	0.305555556
2006	134000	67723	42000	0.313432836
2005	118515	62582	34987	0.295211577
2004	114682	62523	24726	0.21560489
2003	117307	61765	20152	0.171788555
2002	125179	64757	17945	0.143354716
2001	83973	63211	12243	0.145796863
2000	38989	59939	9121	0.233937777
1999	23749	54466	7748	0.326245316
1998	17622	51001	7379	0.418737941
1997	22410	46958	7130	0.318161535
1996	20905	42503	6570	0.314278881
1995	20381	39613	5750	0.282125509

Sources: Chinese Ministry of Education, International Students Leading place of Origin Fact Sheets 2001- 2012 (<http://www.iie.org/Research-and-Publications/Open-Doors/Data/International-Students/Leading-Places-of-Origin/2010-12>), Open Doors Fact Sheet China 2012

## **Conclusion: The New Brain Drain: The Exodus of China's Dreams**

In the last two decades China has witnessed unparalleled emigration alongside significant growth in domestically owned intellectual property. From 1988 and 2008 (the most recent year of public data from China's ministries) roughly 1.2 million Chinese students have studied abroad. In that same time period, roughly 330,000 students have returned to China. Across these twenty years there is an average return rate of 28% (Ministry of Education). From 1997 to 2011, domestic residents filed for over 1.7 million patents, 63% of the total patents filed for China in that time period (WIPO). Both of these metrics are manifestations of China's enormous growth, and its development into a global power.

Chapter One examined the tragic events that created a society prone to quashing innovative tendencies, and the historical legacies that still remain deeply rooted in Chinese society. The second chapter explored the current state of intellectual property in China through the lens of China's 2006 Medium to Long Range plan meant to stimulate 'indigenous innovation.' Finally the third chapter analyzed the changing trends of Returnees and the role of human capital in China's future innovation. Together, these three chapters advance a new understanding of the role of human capital in stimulating China's future growth, and a new, unexpected type of 'brain drain.'

Despite media criticisms of China's practices of 'imitation,' China has done many things throughout the past two decades to stimulate innovation. Government procurement of innovation has caused China to account for 455,608 of 2011 WIPO filings, making China the number one country for total patent filings for the second year in a row. China's Special Economic Zones have allowed hundreds of domestic companies to flourish; they have attracted

significant foreign investment to the region. Due to these zones and to many other factors, the rate of Returnees has increased during the past decade; today roughly 42% of Chinese students are returning.

Despite everything that government has done, there are two major phenomena that imply its policies are not working as effectively as it had hoped. First, data on patent and publication filings indicates that the rate of *invention* is increasing. While sitting in the Shanghai patent office, I was fortunate to meet Zhang Mao, a seventy year-old returnee and founder of his own scientific business on which he collaborates with NASA. After explaining my project, he averred, “The government hopes the small group of [Returnees] will help China develop and take off; however from its recent implementation you can see the policy is not effective. The reasons are due to government policy, the state of society, history, wages, living environment, Chinese culture, service levels, science and technology levels, and China’s research atmosphere”.<sup>21</sup> Although Zhang’s negativity reflects the sentiments of many Returnees and OCs who have lived through or were born during the Cultural Revolution, he makes many strong objective points. There are so many social and cultural factors impeding China’s growth that it impossible for the government to tackle them all through policy reform.

Through my work I have attempted to highlight certain values rooted deeply in China’s society that challenge Returnees’ ability to re-integrate back into society. As mentioned in Chapter One, Confucian values remain pervasive in Chinese society. The role of the family, in particular, plays a unique role for the modern Returnee. More specifically, today’s Returnees are the product of China’s Family Planning laws; they are all only-children. Returnees who belong

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<sup>21</sup> Translated from personal correspondence with Zhang. 8 Jan 2013. Translated by author: “回来的只是一小部分，而真正的精英大部分没有回来，如果能够吸引他们回来，确实能帮助中国发展和起飞。但是从目前进行的情况看，效果并不理想。原因是多方面的，包括政治，社会状态，历史，待遇，生活和居住环境，文化，服务水平，科技水平，科研和学术氛围，家庭等很多原因”

to China's rapidly growing upper-middle class often have parents who urge them to achieve academic success at the cost of everything else. Students are pushed to fight China's increasingly competitive society by focusing on grades and little else. Students rarely learn the skills necessary to survive independently abroad. Although living abroad offers the experience to learn these skills, it is an opportunity not all Chinese students take advantage of. As mentioned in Chapter Three, many Returnees repatriate jobless and are unable to support their families. The Confucian notion of family places the burden on the individual child who is likely expected to support two generations of elders along with their own future family.

Confucianism still rests at the foundation of the Chinese education system, where children are encouraged to memorize from a young age. China's government has recognized the double-edged sword that a more liberal education would create. On one hand, structuring China's education system to focus on critical thinking and originality would provide great benefits for China's innovation goals. However, an educational mindset of critical thinking would cause citizens to question all facets of China's society, including policy, government, and law. The government, among others, is not ready for a society that challenges authority.

For any society, changing the way knowledge is created and transmitted is a challenging feat. But in China, it poses a problem central to the country's future growth. An important piece of the solution has long been Returnees, whose exchange of knowledge with global communities has allowed for controlled economic stimulation upon their return. Returnees have provided the ideal human capital platform for broadening China's education structure without implementing large-scale reforms that threaten the course of the nation.

The importance of international knowledge exchange is evident in policy changes here in the U.S. Duke University is just one of many universities investing in creating overseas

campuses. With its joint campus with Wuhan University in Kunshan China, Duke will be the second American university, after New York University, to have established its own campus in China. International exchange is essential to our increasingly globalized world. Current college students have been raised in a global environment where global interaction and exchange allows one to excel in the work environment regardless of discipline. Moreover, global knowledge exchange encourages a strong diversity of ideas, which leads to stronger teams, better management, and the creation of new products. Although China's human capital strategy may not be working out, it is something that every nation can learn from.

The second phenomenon I noticed through my research was a mass exodus in wealth from China. As mentioned in Chapter Three, China's wealthiest individuals, the top .16 of its population, have already emigrated abroad. Given the relative newness of this phenomenon (data on wealth became publically available late in 2012) and privacy concerns, it is challenging to obtain data on many of China's wealthiest individuals. Are Returnees related to this exodus of wealth? Because of the lack of individual data I have not been able to analyze the connection. However, based on my project, I believe successful Returnees may likely be among the wealth exodus. My research allows one to deduce certain trends in human capital:

- 1) An increasing number of students can afford to study abroad through self-funded means. These students are likely part of China's quickly growing upper middle class. They are exposed to different cultural, social and educational systems while abroad that challenge their ingrained views. This in turn, is what allows them to return to China and innovate.
- 2) Although many Chinese students would like to stay abroad, many OC's return to China for personal reasons, or because they cannot secure a visa abroad.

3) Returnees fit into two categories: they are either considered ‘seaweed’ and likely attended a low-tier American college, speak minimal English, and possess few marketable skills; or, they take up either high-level management positions or research positions, or they launch their own ventures.

4) This Returnee entrepreneurs are most likely to become China’s wealthiest individuals. As founder of SOHO China, Xin points out, many of these Returnees are aware of the impact of corruption and systems of *guanxi* connections on China’s business system, that plague China. Corruption and bureaucratic policies slow China’s economic and business growth. Many of them may eventually emigrate the country, seeking better quality of life and economic opportunities.

If my hypothesis stands, then China is facing a new and potentially even greater catastrophe. This year China will award just under 8 million college degrees, and another 200,000 students will go abroad (Bradsher 2013). Domestically, China is no longer facing a lack of talented youth. Instead China’s ‘brain drain’ of the 1980’s and 1990’s is becoming a ‘wealth drain.’ Many of China’s talented individuals have returned to China to pursue the economic opportunities of an emerging economy. After playing the market, these individuals are now leaving the country to become overseas Returnees; and they are taking their talent and wealth along with them.

This phenomenon became apparent around November of 2012, five months into my thesis research. At the time, I did not appreciate the significance of the data. However, as the statistics seep into American journalism, I realize this trend will have significant economic, cultural, and societal effects on China across the next few decades. The ramifications of China’s wealth exodus will affect international communities, China, and the relationship among the two.



It deserves further study. If I had the time, access, and data I would pursue the connections among China's Returnees, China's growing innovation, and these wealthy individuals. However, if my hypothesis—China's Returnees are becoming China's wealthiest—stands, then the question also becomes: is their Western education penetrating Chinese society? Instead, it could be enticing them back to the West.

Nonetheless the Chinese State should not be discouraged. China has proved itself a resilient and dynamic culture capable of producing tremendous things. The growth of Returnees and the rise of inventions are strongly correlated. China's policies have correctly identified the human capital potential in Returnees. Their policy bodes strongly that China is moving in the right direction. Although it will need to assess its current business environment, education, and cultural systems, as well as the exodus of wealth, these are only rungs to climb on the long ladder to China's growth to an international power.

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